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THE OPTIMAL ALLOCATION OF ARMY ENLISTMENT INCENTIVES BY MOS: ANALYSES OF CY 86 - 87 EXPERIENCE, IMPACTS OF NONMONETARY GUIDANCE COUNSELOR INCENTIVES, AND PC SOFTWARE

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Over the period CY86-87, the US Army contracted over 151,000 GSA (HSDG.I-III A Mental Category) recruits, involving incentive expenditures of $287.4M in the form of either enlistment bonuses or Army College Fund awards. Such incentives expand the market and redistribute recruits over difficult to fill MOS's. The thrust of this interim report has been to develop and exercise a methodology for aiding in the allocation of the above incentives by MOS, given the quotas needed, the recruiting environment anticipated, the prices of various incentive types, the levels of other Army resources being expended, and the level of non-monetary incentives in place. The model is built at the battalion, quarterly level, its decision parameters capable of being updated as more experience becomes available.

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Analyses of CY86-CY87 Experience, Impacts of Nonmonetary Guidance Counselor Incentives, and PC Software

Prepared for:

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DISCLAIMER

The views and/or findings contained in this report are those of the authors and should not be construed as an official Department of the Army policy position or decision, unless designated by other documentation.

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1.0 INTRODUCTION

1.1 Scope

This is the first part of a 12-month study begun in late September of 1988 and scheduled for completion in late September of 1989. It represents a milestone in a series of research efforts,[1] initiated in mid-1985, geared to improving the allocation of monetary and nonmonetary enlistment incentives used by the U.S. Army to attract quality[2] recruits.

To appreciate the magnitude of the amount of money involved in enlistment incentives for the Army, more than a billion dollars was spent on the Army College Fund (ACF) and enlistment bonuses (EBs) over FY81-FY85. More recently (since so-called delinkage[3] in December 1985), the 151,389 GSA recruits

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1. See reports by Morey, Richard C. and Lovell, C. A. Knox, covering the four previous efforts, namely: (1) "Enlistment Incentives: Factors, Problem Definition and Formulation," Delivery Order 1618, Contract DAAG 29-81-D-0100, begun May 29, 1985, and concluded August 5, 1985; (2) "A Prototype Model for Allocating Army Enlistment Incentives: A Feasibility Phase," USAREC SR86-3, begun in September 1985 and concluded in February 1986; and (3) "Improving the Allocation of Monetary and Nonmonetary Enlistment Incentives for the U.S. Army: Analysis of FY81-FY86 Experience," Delivery Order 2476, Contract DAAG 29-81-D-0100, begun in July 1986 and concluded in February 1987; and (4) "Allocation of the Army's Monetary and Nonmonetary Incentives: Sensitivity to Goals, Estimation Technique, Delinkage Policy, and ACF Actuarial Cost Assumptions," May 1987 to September 1987. Also see "The Allocation of Consumer Incentives to Meet Simultaneous Sales Quotas: An Application to U.S. Army Recruiting" by Morey and Lovell, Management Science (forthcoming).

2. Quality refers to the Army's designation of a GSA recruit, i.e., one who has a high school degree diploma and who also scores above the 50th percentile on the Armed Forces Entrance Exam.

3. This will be discussed subsequently.

contracted for over the 24-month period from January 1986 to December 1987 involved incentive expenditures totaling $287.4 million.[4] Hence, the average dollar incentive per GSA recruit for just the ACF and EBs (not including, for example, the Federal Loan Repayment Program option was $1,911. Also, about 32.5 percent of the $287.4 million was spent on EBs, with about 53.6 percent of all GSA recruits receiving either an EB or an ACF benefit.

To elaborate briefly on "delinkage," which occurred in mid-December of 1985, the Army was no longer allowed to award to a recruit <u>both</u> the ACF and an EB benefit. Prior to December 1985, approximately 43 percent of those GSA recruits receiving an incentive received both the ACF and an EB. This change, aimed at reducing the Army's annual incentive expenditures, made most past historical experience substantially irrelevant in terms of supply forecasting and budget generation. Hence, the focus of this latest study has been exclusively devoted to data analysis since delinkage.

To provide an overview of the thrust of the PC software being installed at Fort Sheridan as part of the first phase of this study, see figure 1. This schematic shows the inputs and outputs involved in the budget generation and incentive mix allocation of a PC program at the MOS level. Its purpose is to provide a defensible rationale for the amount of funds the Army needs, as well as guidelines for the mix of incentive types to be offered, so as to efficiently meet net contract quotas of GSA recruits by MOS. The contract quotas can be

4. For the ACF benefits, this figure utilizes the DOD actuarial estimates of the costs required to be escrowed for each taker of the ACF, namely, $2,888 for each 2-year taker, $3,750 for each 3-year taker, and $3,895 for each 4-year taker. Also, the figures shown are for unnetted or gross contracts; they do not take into account the DEP loss factor, which averages 7.33 percent over all MOSs.

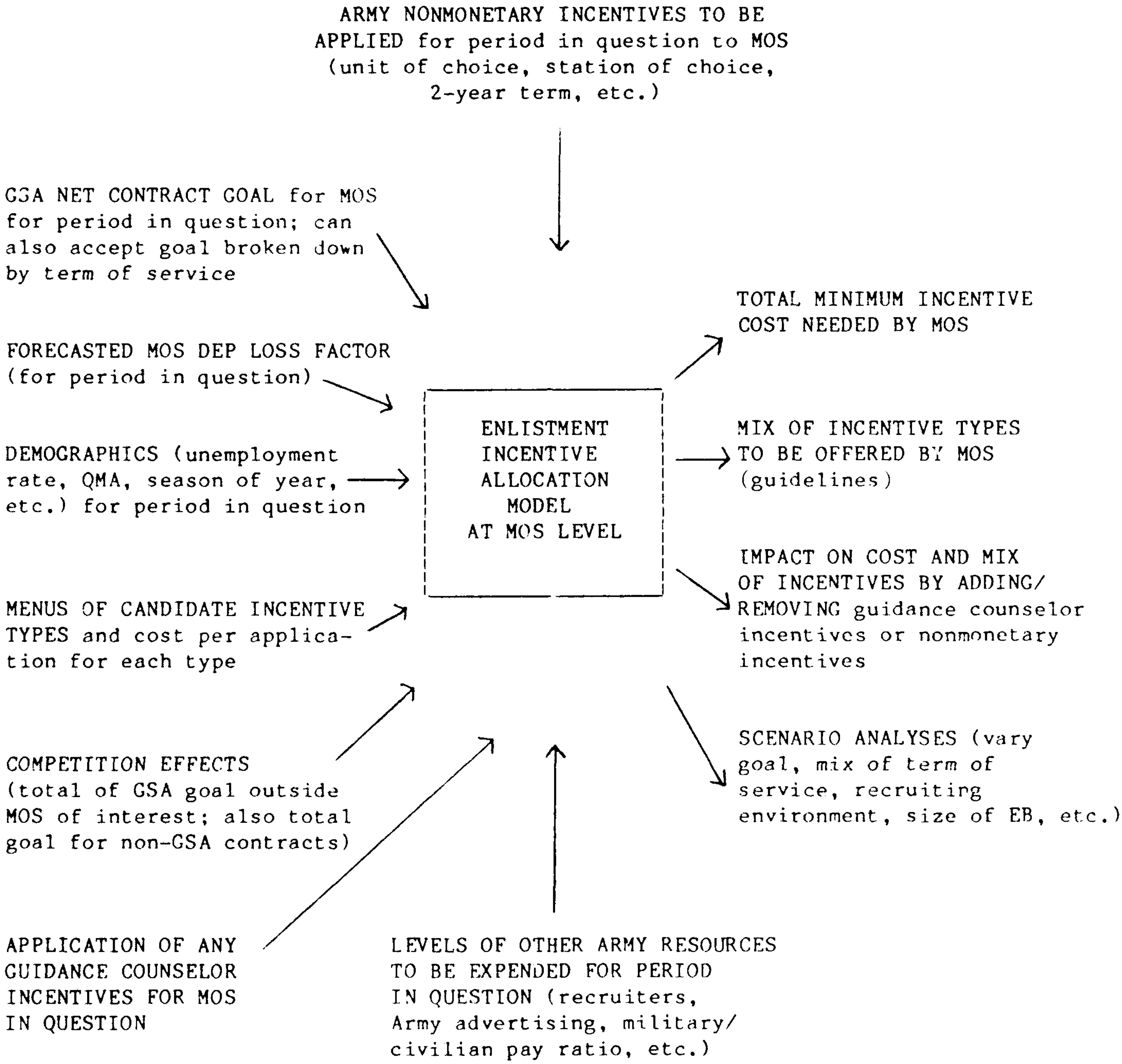

Figure 1. Inputs and outputs for the budget generation and incentive mix allocation program related to enlistment incentives by MOS

further broken down as to the mix of term of service desired.[5] The inputs for some upcoming period of interest (e.g., some outyear in the POM budget generation process or some upcoming quarter in a budget execution mode) can include: the anticipated recruiting environment (e.g., the average local unemployment rate, QMA, etc.); the level of other recuiting resources to be expended (recruiters, advertising, military/civilian pay ratios, etc.); application of any special guidance counselor awards for the MOS in question; and application of any nonmonetary incentives (e.g., unit or station of choice, 2-year term, etc.). The key outputs include (1) a forecast of the total incentive dollars needed for the MOS, and (2) guidelines for splitting the money between ACF and EB expenditures.

The guidelines for the mix of incentives are especially significant because Congress prohibits the Army from comingling funds earmarked for the ACF and EBs.[6] Hence, USAREC needs a utilization plan for splitting its incentive funds to achieve the quotas (and possibly the mix of terms of service) desired and to do so efficiently. Discerning the efficient mix by MOS is not an easy task because the only data available are what was actually expended, which may not have been optimal. Inferring efficient behavior from perhaps inefficient behavior is the key task at hand. The analytic strategy must also deal with the

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5. This could be important for the planning of Active Duty and Reservist man years. Alternatively, one can input an overall GSA contract goal and use the same mix of term of service as obtained in the past, or vary the term of service mix to find the cost impacts.

6. Only $10M can be reprogrammed without congressional approval, a small percentage. Part of the rationale for this noncomingling is due to the distinct roles of EBs and the ACF: the ACF is viewed as a method for expanding the general supply, whereas the EB is viewed more as a redistribution mechanism (among MOSs). In keeping with this philosophy, the ACF benefit is advertised but the EB benefit is not.

competitive effects associated with simultaneous GSA goal requirements for other MOSs and non-GSA contract goals, as well as the complex recruiting environment. As described in detail in Section 4.0, this is done by generating separate estimates of the parameters describing the recruiting technology,[7] as well as the parameters describing over- or underutilization of monetary incentives, relative to the cost per unit of using those incentives. This is accomplished through the use of simultaneous regression modeling, whereby a system of equations is estimated simultaneously to approximate a so-called cost frontier. The statistical programs for accomplishing this are available in the SAS and SPSS set of routines. Similar approaches have been successful in the hospital and electric power generation industries, to name a few.

1.2 Key Summaries

Before getting into the details, it is helpful first to summarize actual experience over CY86-CY87, broken down for six key[8] Combat Arms MOSs, all remaining Combat Arms MOSs, and all non-Combat Arms MOSs (see table 1). Note that about 36.5 percent of all GSA contracts received the ACF benefit, with 17.1 percent receiving the EB. As mentioned earlier, about 32.5 percent of all the funds were expended on EBs.

Table 2 shows by MOS, by quarter for the entire 24-month period, how the $287.4M was spread over the eight MOS groupings and how widely EB utilization has varied, even within a given MOS. Tables 3 and 4 show the type

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7. For example, curvature parameters related to isoquandts.

8. A complete breakdown for all Combat Arms of GSA contracts obtained over CY86-CY87 is included in Appendix A. We note these six MOSs contained 83.3 percent of all Combat Arms GSA contracts.

Table 1. Summary of actual experience for GSA* contracts over all MOSs (Jan. 1986-Dec. 1987)

	11X (Infantry)	12B (Combat Engin)	13B (Canon) Crewman)	13F (Fire Support Specialist)	19D (Cavalry Scout)	19K/19X (Armor Crewman)	All Other Combat Arms MOSs	All Other Non-Combat Arms MOSs	All MOSs
Total Number of GSA Gross Contracts	19,660	3,145	5,664	1,665	2,215	2,907	7,133	108,010	150,389
2 years	5,106	395	1,004	585	704	990	1,439	16,907	27,130 (18.0%)
3 years	5,954	2,162	1,598	526	733	697	2,785	37,640	52,095 (34.6%)
4 years or more	8,600	593	3,062	557	781	1,223	2,909	50,959	71,188 (47.3%)
Number of ACF Takers (avg of ACF benefit)	9,044 @ $3,299	1,944 @ $3,599	1,668 @ $3,278	1,001 @ $3,277	1,410 @ $3,336	1,711 @ $3,264	3,790 @ $3,477	34,371 @ $ 3,787	54,939 (36.5%) @ $ 3,531
Number of EB Takers (avg value of EB)	6,982 @ $3,904	456 @ $2,457	3,458 @ $4,881	485 @ $3,254	541 @ $2,687	1,003 @ $3,383	1,578 @ $3,526	11,174 @ $ 3,284	25,677 (17.1%) @ $ 3,638
Percent Receiving ACF or EB	81.5%	76.3%	90.5%	89.2%	88.1%	93.4%	75.3%	42.2%	53.6%
Total Incentive Dollars Expended	$58.31M (20.3%)	$8.072M (5.1%)	$24.085M (8.4%)	$4.862M (11.7%)	$6.594M (2.3%)	$9.509M (3.3%)	$18.69M (6.5%)	$157.28M (54.7%)	$287.401M
Average Cost/ GSA Contract	$ 2,966	$ 2,567	$ 4,252	$ 2,920	$2,977	$3,271	$2,620	$1,456	$1,911
DEP Loss Factor	6%	5.9%	5.5%	5.5%	3.3%	5.5%	5.5%	7.98%	7.33%

* GSA refers to those recruits with a high school diploma and who score above the 50th percentile on the AFES. Incidentally, over this same period, 105,130 non-GSA contracts were also obtained.

Table 2. Actual fraction* of MOS incentive expenditures spent on EB by MOS by quarter

	11X (Infantry)	12B (Combat Engin)	13B (Canon) Crewman)	13F (Fire Support Specialist)	19D (Cavalry Scout)	19K/19X (Armor Crewman)	All Other Combat Arms MOSs	All Other Non-Combat Arms MOSs
Quarter 1 (Jan 86-Mar 86)	61.0%	40.5%	85.7%	46.7%	45.8%	77.2%	46.9%	31.8%
Quarter 2 (Apr 86-June 86)	61.5%	29.2%	86.9%	48.2%	33.1%	53.1%	36.6%	28.9%
Quarter 3 (July 86-Sept 86)	59.2%	19.5%	89.7%	43.6%	49.2%	57.8%	44.2%	24.4%
Quarter 4 (Oct 86-Dec 86)	49.5%	17.9%	85.1%	40.3%	20.2%	39.8%	20.9%	15.1%
Quarter 5 (Jan 87-Mar 87)	33.0%	0	71.7%	28.3%	4.1%	14.2%	24.3%	18.1%
Quarter 6 (Apr 87-June 87)	43.8%	0	51.1%	30.8%	5.7%	7.6%	14.8%	22.7%
Quarter 7 (July 87-Sept 87)	26.5%	0	51.5%	26.4%	5.7%	17.4%	9.3%	23.5%
Quarter 8 (Oct 87-Dec 87)	28.0%	0	31.6%	15.3%	8.1%	23.1%	8.1%	27.5%
Overall** (Jan 86-Dec 87)	45.4%	13.2%	69.1%	33.8%	24.2%	36.6%	26.4%	24.0%
Total Incentive Dollars Over Jan 86-Dec 87	$58.31M	$8.072M	$24.085M	$4.862M	$6.594M	$9.509M	$18.69M	$157.278M
Average Size of EB	$3,904	$2,451	$4,881	$3,254	$2,686	$3,383	$3,526	$3,284

* The balance is the ACF fraction.

** The overall fraction of dollars spent on EBs was 32.5 percent over all MOSs.

Table 3. Summary of actual experience for MOS 11X (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	5,106	5,954	8,600	19,660 (62,474 GSA Active Duty man years)
DEP Loss Factor	6.4%	5.9%	5.8%	6.0%
Number of ACF Takers	4,881 @ $2,888	2,899 @ $3,750	1,264 @ $3,895	9,044 @ avg of $3,299
Number of EB Takers	0	2,315 @ avg of $3,615	4,667 @ avg of $4,258	6,982 @ avg of $3,904
Percent of GSA Recruits Receiving ACF or EB	95.6%	87.6%	69.0%	81.5%
Total Cost	$14.963M	$19.33M	$24.885M	$58.311M
Actual Cost Share for EB	0%	43.56%	80.1%	45.4%
Average Cost/ GSA Contract	$ 2,930	$ 3,247	$ 2,894	$ 2,966
Average Cost/ GSA Active Duty Man Year	$ 1,465	$ 1,082	$ 723	$ 933

Table 4. Actual quarterly variation in MOS 11X GSA contracts, competition, fraction of expenditures spent on EBs, fraction of contracts sold off first 3 screens, and key recruiting variables

	GSA Contracts in 11X	GSA Contracts Outside 11X	Non-GSA Over All MOSs	Fraction Sold Off First 3 Screens	Total Incentive Costs	Fraction of Actual Total Incentive Expenditure Spent on EBs (fraction spent on ACF is one minus fraction spent on EBs)	Average Number of Army Recruiters	Local Unemployment Rate	Size of Eligible* Populatior
Quarter 1 (Jan 86-Mar 86)	1,878	18,426	14,500	9.89%	$7.40M	61.0%	4,745	7.76%	9.816M
Quarter 2 (Apr 86-June 86)	2,428	18,657	12,595	43.67%	$9.43M	61.5%	4,696	7.27%	9.816M
Quarter 3 (July 86-Sept 86)	2,496	18,948	14,942	36.00%	$10.09M	59.2%	4,850	7.4%	9.816M
Quarter 4 (Oct 86-Dec 86)	2,521	16,564	14,075	33.72%	$8.49M	49.5%	4,904	6.67%	9.816M
Quarter 5 (Jan 87-Mar 87)	2,752	16,737	13,161	34.8%	$7.60M	33.0%	4,935	7.35%	9.634M
Quarter 6 (Apr 87-June 87)	2,860	13,997	11,692	39.79%	$6.62M	43.8%	4,980	6.45%	9.634M
Quarter 7 (July 87-Sept 87)	2,462	16,555	13,174	39.3%	$4.35M	26.5%	4,906	6.36%	9.634M
Quarter 8 (Oct 87-Dec 87)	2,263	13,834	11,041	89.2%	$4.33M	28.5%	5,024	6.18%	9.634M
Over All 8 Qtrs	19,660	131,290	105,130	40.8%	$58.311M	45.4%	4,880	6.93%	9.729M

* This is the total QMA. Unfortunately, the portion who qualify for the GSA designation is not available.

of detail available by MOS, the illustrations being for MOS 11X (Infantry), and for all non-Combat Arms MOSs (table 5). Summaries for other MOSs are in Section 5.0.

1.3 Organization of Remainder of Report and Remaining Tasks Under Contract

Section 2.0 is an overview of the extensive data utilized, built by the investigators from the raw Mini-Master files. Section 3.0, with four subsections, is a representative detailed analysis for 11X (the single most costly MOS). It illustrates the use of the tables, the rationale used, the regression results, credibility insights, the elasticity estimates available, and a sample run of the PC software for the last quarter of CY87. Section 4.0 is the technical section of the report, providing a description of the analytical methodology used, relying on simultaneous econometric modeling and the use of the Translog cost frontier functional form. Section 5.0 provides summaries of the results for the other key seven MOS groupings, using a format identical to that described in Section 3.0 for 11X.

Finally, Appendix A contains the detailed contract breakdowns for all Combat Arm MOSs; Appendix B, the regression results for the other seven MOS categories; and Appendix C, the User Guide for the PC software delivered.

To put this report in perspective, relative to the remainder of the contract scheduled for completion by October 1, 1989, the remaining tasks are to exercise the PC program on the actual data for the first two quarters of CY88 (out-of-sample data) and "validate" the findings. Then these additional two quarters of data are to be merged with the earlier eight quarters of data, the regression results repeated, and the PC programs updated and delivered to USAREC. Also, the computer programs (and documentation) for building the files from the Mini-Master data are to be delivered to USAREC. This will enable

Table 5. Summary of actual experience for aggregation of all non-Combat Arms MOSs (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or More	Total
Number of GSA Contracts (gross)	16,907	37,640	53,463	108,010
DEP Loss Factor	8.6%	7.74%	7.93%	7.98%
Number of ACF Takers	13,581	15,368	5,422	34,371 @ $ 3,507
Percent of GSA Recruits Receiving ACF or EB	80.3%	41.3%	30.7%	42.2%
Total Costs	$39.22M	$57.98M	$60.08M	$157.278M
Average Actual Cost Share for EB	0	1.7%	64.85%	21.3%
Average Cost/GSA Contract	$2,320	$1,540	$1,124	$1,456

USAREC to redo the regressions and update the PC program as more data become available.

2.0 GENERAL DATABASE CONSIDERATIONS (181,835 GSA Contracts Over January 1986-June 1988 Totaling $333M in Incentive Expenditures)

The following summarizes the basic data elements available and utilized:

1) Ten quarters and 54 domestic battalions, for a total of 540 cells:

2) By cell, the number of gross[10] GSA contracts for six different key Combat Arms MOSs--11X (Infantry), 12B (Combat Engineer), 13B (Canon Crewman), 13F (Fire Support Specialist), 19D (Cavalry Scout), and 19K/19X (Armor Crewman)-- and two catchalls, i.e., one for all other Combat Arms MOSs and one for all non-Combat Arms MOSs. (Source: Army's Mini-Master file.)

3) By MOS, by cell, the number of GSA contracts broken down by term of service, i.e., 2 year, 3 year and 4 year or more. (Source: Mini-Master file.)

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9. This is the period after delinkage (Dec. 15, 1985), whereby the recruit could no longer receive both an EB and the ACF. Prior to delinkage, about 43 percent of those recruits receiving a monetary incentive received both; also, about 27 percent of all GSA recruits, prior to delinkage, received one or the other or both. The period January 1986-June 1988 also covers the important initiation of guidance counselor incentives (in April 1986).

10. Gross contracts are the focus, instead of net contracts, partly because of the anomalous manner in which net contracts are computed (over time), and partly based on the desire to update the PC programs with new experience before net contracts are known. DEP loss factors by MOS are also available.

4) <u>By MOS, by cell, by term of service</u>, the number of takers of the

   a) ACF option and dollar value of each EB paid (the latter varied substantially over the 30-month period). (Source: Mini-Master file and USAREC.)

   b) The actuarial escrow costs for the 2-year ACF, 3-year ACF, and 4-year ACF (from DOD).

5) Also, by cell, the following was available from the Mini-Master file:

   a) totals of non-GSA contracts obtained (competitive effect on GSA contract production),
   b) number of recruiters present,
   c) QMA present,
   d) local unemployment rate, and
   e) number of GSA contracts obtained outside each given MOS.

6) By cell, the average percentage of GSA contracts obtained that were sold off of the first three screens, as related to the guidance counselors' efforts, for each MOS by quarter, whether the MOS earned the special "points" if it were indeed sold that quarter.

7) Related to the nonmonetary benefits, whether or not the MOS for each quarter was eligible for the "station of choice" or "unit of choice" benefit.

8) The above enables one to compute by cell for each MOS the total incentive cost incurred, and to break that cost down by term of service and type of incentive. Hence, for example, for the Albany, NY, battalion, for the quarter of Oct.-Dec. 1987, for 11X, for a 3-year term of service, one knows the total incentive cost obligated, the fractions for EB and ACF, and the average cost per GSA contract.

9) Other factors not utilized, because complete data were not available from USAREC, that could eventually be incorporated include Army advertising, military/civilian pay ratios, the size of the GSA-eligible population by battalion, the size of the Delayed Entry Program pool, and takers of the Federal Loan Repayment option.

3.0 REPRESENTATIVE ANALYSES FOR MOS 11X AND INTERPRETATION OF TABLES

3.1 Summary of Actual Experience

We performed eight separate detailed analyses for eight key MOS groupings. These groups were 11X (Infantry), 12B (Combat Engineer), 13B (Canon Crewman), 13F (Fire Support Specialist), 19D (Cavalry Scout), 19K/19X (Armor Crewman in M1 or M60 tank), and two "catchalls" (the other 23 "small" Combat Arms MOSs and the remaining non-Combat Arms MOSs). Over CY86-CY87, there were approximately 150K gross[11] GSA contracts, of which about 108K were for the non-Combat Arms MOSs; hence, about 42K Combat Arms GSA enlistments were contracted for over this 2-year period. Also, there were about 105K non-GSA enlistments contracted for over this same period. By far, the largest single MOS was 11X (Infantry), with

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11. Unadjusted for DEP loss, which overall was 7.3 percent.

19,660 GSA contracts and an incentive expenditure over the 2-year period of $58.3M, representing 20.3 percent of the overall total of $287.4M. Consider from table 6 the key facts for MOS 11X:

1) From the last column of row 1, the total number of gross GSA contracts in 11X was 19,660, entailing an incentive cost of $58.311M for 11X alone (row 6), for an average cost per GSA contract of $2,966 (row 8). Over the different terms of service, about $15M was expended for 2-year recruits (row 6, column 1), $19M for 3-year recruits, and $25M for 4-year or over terms of service.

2) Overall DEP loss (row 2) was 6.0% percent hence, about 1,200 of the 19,600 gross GSA contracts attrited while in DEP.

3) There were 9,044 takers of the ACF (row 3) at an average acturial cost of $3,299 per ACF taker,[12] and 6,982 EB takers (row 4) at an average EB value of $3,904. Of the ACF takers, over half were for 2-year terms; of the EB takers, about two-thirds were for 4-year or more terms. Note that 81.5 percent of all GSA recruits in 11X received either the EB or the ACF (row 5). Some of the balance were takers of "unit of choice" or the Federal Loan Repayment Program option (both thereby forfeiting either the ACF or EB).

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12. This assumes that the actuarial costs per "taker" for the 2-year ACF was $2,888, $3,750 for each 3-year ACF taker, and $3,895 for each 4-year ACF taker. These are the amounts required by the Department of Defense to be deposited in an escrow account for each ACF taker.

Table 6. Summary of actual experience for MOS 11X (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	5,106	5,954	8,600	19,660 (62,474 GSA Active Duty man years)
DEP Loss Factor	6.4%	5.9%	5.8%	6.0%
Number of ACF Takers	4,881 @ $2,888	2,899 @ $3,750	1,264 @ $3,895	9,044 @ avg of $3,299
Number of EB Takers	0	2,315 @ avg of $3,615	4,667 @ avg of $4,258	6,982 @ avg of $3,904
Percent of GSA Recruits Receiving ACF or EB	95.6%	87.6%	69.0%	81.5%
Total Cost	$14.963M	$19.33M	$24.885M	$58.311M
Actual Cost Share for EB	0%	43.56%	80.1%	45.4%
Average Cost/ GSA Contract	$ 2,930	$ 3,247	$ 2,894	$ 2,966
Average Cost/ GSA Active Duty man year	$ 1,465	$ 1,082	$ 723	$ 933

4) From table 4, column 6, row 9, the average overall fraction of total incentive expenditures for 11X spent for EBs was 45.4 percent. This fraction varied from 61.5 percent in the second quarter of CY86 to 26.5 percent in the third quarter of CY87. And from table 6, rows 6 and 7, of the total of nearly $25M in incentive cost paid to GSA recruits with a term of service of 4 or more years, 80.1 percent was expended on EBs. The corresponding percentages were 43.6 percent for 3-year recruits and, of course, 0 percent for 2-year recruits because EBs are only given for more than 2 years of contracted service.

5) From table 7, the dollars paid out in EBs for 11X ranged from $2,500 to $5,000; the average was $3,904. From table 6, row 3, last column, the weighted average actuarial cost for the ACF option for 11X was $3,299. The total number of ACF and EB takers in 11X was about 9K and 7K, respectively (table 6, rows 3 and 4, last column).

6) From table 4, column 4, the percentage of GSA contracts in 11X sold by the guidance counselors off the first three screens (i.e., first 15 slots) averaged 40.8 percent; it varied from a low of 9.89 percent in quarter 1 (before guidance counselor incentives went into force) to 89.2 percent in quarter 8.

3.2 Summary of Forecasts of Efficient Behavior and Rationale: Discussion of Regression Results

This important subsection first shows the type of analytical results available. Secondly, the detailed regression findings are discussed, from

Table 7. Comparison of actual, historical prediction, and predicted efficiert for costs and fraction spent on EBs for MOS 11X (Jan. 1986-Dec. 1987) (to deliver actual total of 19,660 GSA contracts, broken down to 5,106 for 2-year, 5,954 for 3-year, and 8,600 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Expended on EBs Over 8 Quarters	Number of Gross GSA Contracts
Related Total Incentive Expenditure (actual)	$58.311M	45.4%	19,660
Average of EB and Range	$3,904 ($2,500-5,000)	45.4%	19,600
Predicted Cost (based on history only, ignoring Army inefficiencies)	$57.911M	45.4%	19,660
Predicted Efficient Levels	$54.76M	22.3% (actual in last quarter was 28.5%)	19,660
Estimated Over Percent Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	22.3%	6.48% (1,377 contracts)

the standpoint of instilling credibility in the results obtained. These regression results form the basis for the predictions.

1) From table 7, we estimate--given the recruiting environment, the actual number and mix of GSA contracts obtained in 11X, the actual number of GSA contracts obtained in other MOSs, and the actual non-GSA contract outcomes--that a higher fraction of the budget should have been programmed for the ACF option. That is, instead of the actual average (over the two years) of 45.4 percent of the total 11X incentive costs being expended for EBs, the average ideally should have been 22.3 percent. It is further estimated this would have reduced costs, for the same level and mix of contracts, by about $3.6M; alternatively, about 6.48 percent (1,274) more GSA contracts in MOS 11X could possibly have been obtained for the level of expenditures actually incurred. For the detailed analytical rationale, the reader is referred to Section 4.0.

To illustrate the mechanics of estimating optimal behavior from observed behavior for 11X, we rely on the regression results in tables 8 and 9.[13] Note first the following: (1) the coefficient in the cost equation for 11X, associated with the logarithm of the price of the EB (denoted as LPEB in table 8), is seen to be about 0.042; (2) the intercept in the simultaneously estimated EB cost-share equation for 11X (table 9) is about 0.273. This informs one (see Section 4.0) that the optimal share of the EB expenditures

13. These results are discussed verbally very shortly.

Table 8. MOS 11X simultaneous regression results on total cost

SYSTEM WEIGHTED MSE IS 1.01704 WITH 835 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.904013

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE*	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.8721120	0.21994976	3.993
LY1	0.46897631	0.04310638	10.880
LY2	0.32552262	0.0391289	8.319
LY3	0.15372507	0.05719741	2.688
LOTHGSA	-0.000608371	0.0332281	-0.018
LPEB	0.04215031	0.12449292	0.339
LPACF	0.95784969	0.12449292	7.694
LY1SQ	0.13287558	0.01200649	11.067
LY2SQ	0.10363877	0.009519558	10.887
LY3SQ	0.11937111	0.02944069	4.055
LY1Y2	-0.121372	0.01285603	-9.441
LY1Y3	-0.0412481	0.02000112	-2.062
LY2Y3	-0.00621761	0.01870701	-0.332
LPACFSQ	0.43610309	0.03840985	11.354
LPEBSQ	0.43610309	0.03840985	11.354
LPAPEB	-0.436103	0.03840985	-11.354
LPAY1	0.11048883	0.009614398	11.492
LPAY2	-0.0700368	0.007619581	-9.192
LPAY3	-0.0700653	0.01329465	-5.270
LPEBY1	-0.110489	0.009614398	-11.492
LPEBY2	0.07003676	0.007619581	9.192
LPEBY3	0.07006534	0.01329465	5.270
LNONGSA	-0.0375201	0.02928012	-1.281
STATIOND	-0.0161682	0.01755424	-0.921
UNITD	0.05010037	0.02679319	1.870
LRECRUIT	-0.00682794	0.008147341	-0.838
POINTS	0.20783087	0.05339555	3.892
LQMA	0.04573874	0.03198417	1.430
LUNEMP	0.0646784	0.02567734	2.519
LPCPRES	-0.00125711	0.008724379	-0.144
QD1	0.2759332	0.03666609	7.526
QD2	0.12758593	0.02247291	5.677
QD3	0.01587246	0.02400725	0.661
YRD	0.49323262	0.03701186	13.326

* Definitions of the variables are given in Section 4.0.

Table 9. MOS 11X simultaneous regression results on enlistment bonus cost share

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.27275596	0.03440188	7.929
LPACF	-0.436103	0.03840985	-11.354
LPEB	0.43610309	0.03840985	11.354
LY1	-0.110489	0.009614398	-11.492
LY2	0.07003676	0.007619581	9.192
LY3	0.07006534	0.01329465	5.270

should be about 23.1 percentage points (i.e., 0.273-0.042) less than it actually was for the allocations to be so-called "allocatively efficient," i.e., to minimize the cost of achieving the given vector of outputs (various types of contracts) in the recruiting environment specified. Over all eight quarters and 54 battalions, the EB cost share averaged 45.4 percent. But on the average, it should have been about 22.3 percent (i.e., 45.4%-23.1%). (Incidentally, for the last quarter of CY87, the EB cost share actually was 28.5 percent, so perhaps the Army also perceived that it had been overspending on the EBs for 11X.)

To illustrate the interpretation of the results in table 7, row 5: If one had utilized this efficient mix of EBs versus ACF, the simultaneous regression model forecasts that for the typical battalion-quarterly cell[14] at the same level of incentive expenditure, there would have been 7.71 EB takers and 31.79 ACF takers, for a total of 39.50 takers per cell. (This assumes an actual average price of $3,299 for the ACF and $3,904 per EB as per table 6, last column, rows3 and 4, respectively.) This is to be contrasted with the actual average number of 16.162 EB takers and 20.9351 ACF takers per cell, for a total of 37.0971 takers. Hence, for the same total level of expenditures for 11X, we forecast that 6.48 percent more takers could have been obtained. Alternatively,

14. There are 432 cells, i.e., eight quarters and 54 battalions.

we estimate that the actual cost was 6.48 percent higher than necessary for the outcomes that occurred, or that the efficient incentive cost for the actual number of takers is estimated to be \$58.31M/1.0648 = \$54.76M, or 93.9 percent of the amount actually spent (table 7, row 4). If, however, one ignored any inefficiencies and used the cost equation simply to forecast cost, the result would have been \$57.91M, the amount shown in row 3 of table 7. This is close to what was actually spent and confirms the tracking ability of the model.

2) Consider next the following intuitive "validations" of the coefficient associated with the regression cost equation 11X, and the EB cost-share equation, displayed in tables 8 and 9, respectively:

a) Consider first the EB cost-share equation for 11X, i.e., the fraction of the total incentives for 11X devoted to EBs (table 9). (This is the variable on the lefthand side of the regression.) If we denote this by S_{EB}, we obtain (where ln denotes the natural logarithm):

$$\hat{S}_{EB} = .2727 - .436 \ln(\text{PACF}) + .436 \ln(\text{PEB}) - .11 \ln(\text{\# of 2-year GSA contracts}) + .07 \ln(\text{\# of 3-year GSA contracts}) + .07 \ln(\text{\# of 4-year or more GSA contracts}) \quad (1)$$

Note that all coefficients are very significant. Note, too, that the restrictions dealing with price homogeneity[15] (see Section 4.0) are operating as desired.

Note that as the number of 2-year recruits (denoted as Y1) increases, the share of the incentives devoted to EBs goes down. This agrees with the fact that the EB is not available to 2-year recruits; hence, there are more takers of the ACF option. But as 3- and 4-year terms (namely, Y2 and Y3, respectively) increase, there are more takers of EBs. Moreover, as the price of the EB (i.e., PEB) goes up, a larger fraction of the total cost will go to the EB (and just the opposite for the ACF option).

15. This says, for example, that if all prices associated with EBs and the ACF were to double, the total incentive cost would also double.

b) Consider next the 11X cost equation (table 8, with emphasis on the statistically significant coefficients):

ln(total incentive cost for 11X) = .878 + .469 ln(# of 2-year GSA contracts in 11X) + .326 ln(# of 3-year GSA contracts in 11X) + .154 ln(# of 4-year or more GSA contracts in 11X) + .042 ln(price of EB) + .958 ln(price of ACF) + .0665 (ln(# of 2-year GSA contracts))^2 +
.052 (ln(# of 3-year GSA contracts))^2 +
.0595 (ln(# of 4-year GSA contracts))^2 -
.12 ln(# of 2-year GSA contracts) x ln(# of 3-year GSA contracts) - .041 ln(# of 2-year GSA contracts) x (# of 4-year GSA contracts) + .218 (ln(price of ACF))^2 +
.218 (ln(price of EB))2
-.436 ln(price of ACF) ln(price of EB)
+.11 ln(price of ACF) ln(# of 2-year GSA contracts)
-.07 ln(price of ACF) ln(# of 3-year GSA contracts)
-.07 ln(price of ACF) ln(# of 4-year GSA contracts)
-.11 ln(price of EB) ln(# of 2-year GSA contracts)
+.07 ln(price of EB) ln(# of 3-year GSA contracts)
+.07 ln(price of EB) ln(# of 4-year GSA contracts)
+.05 (unit of choice)[16] + .207 (special guidance counselor points available if MOS sold that quarter)[16]
+.065 ln(unemployment rate) + .27 (1st CY quarterly dummy)[16]
+.127 (2nd CY quarterly dummy)[16] + .493 (1986 year dummy)[16]. (2)

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16. This is a 0-1 variable; it is set to 1 when the situation applies.

Then, from the cost equation (2), we note:

a) 11X incentive costs increase when any of the different types of contracts for 11X increase, as expected.

b) 11X incentive costs increase when the price of EBs or the ACF increase, as expected.

c) It will be shown later in Section 3.3 that the coefficients for the squared contracts being positive implies that the elasticities of incentive cost on contracts are increasing, as expected, thereby displaying the increasing marginal cost of adding new contracts.

d) Since the "unit of choice" dummy variable is positive and significant, it will be seen in Section 3.3 that making available the "unit of choice" option for a MOS implies contracts will increase, as expected.

e) Since the dummy variable "guidance counselor points awarded if MOS sold" is positive and significant, it will be shown in Section 3.3 that when this situation applies, GSA contract production increases in 11X, as expected.

f) Since the sign of the coefficient on the local unemployment rate is positive and significant, in Section 3.3 this will be shown to imply that raising the unemployment rate increases 11X GSA contract production for 11X.

g) The positive sign of CY86 implies that CY86 was more costly than CY87 (even when adjusted for differences in contracts and the recruiting environment), perhaps due to the fact that the full impact of the guidance counselor reforms, initiated in April 1986, were not fully realized until CY87.

3.3 Estimation of Elasticities for 11X

1) First, consider the derivation of the key cost/goal elasticities for 11X; more particularly for 11X, we are interested in the important issue of estimating the degree of marginal increasing cost (or equivalently, the rate of diminishing returns) associated with increasing the goal for GSA personnel. Then:

$$\frac{d(\ln C)}{d(\ln(\#\text{ of 2-year GSA contracts}))} \tag{3}$$

is by definition the elasticity of total incentive cost for 11X, relative to the total number of 2-year GSA recruits desired in 11X. From differentiating the cost equation (2), one obtains:

$$\begin{aligned}\frac{d(\ln C)}{d(\ln(\#\text{ of 2-year GSA contracts})} = {} & .469 + (.133)\ln(\#\text{ of 2-year GSA contracts}) \\ & -.12\ \ln(\#\text{ of 3-year GSA contracts}) \\ & -.041\ \ln(\#\text{ of 4-year GSA contracts}) \\ & +.11\ \ln(\text{price of ACF option}) \\ & -.11\ \ln(\text{price of EB option})\end{aligned} \tag{4}$$

Note that the above is an increasing function of the number of 2-year GSA contracts. Hence, the elasticity of total incentive costs on the goal for 2-year GSA contracts is increasing as the goal increases; this is as we would expect.

We next evaluate the elasticity at the overall cell means (the standard procedure). The overall means (over all 432 quarterly-battalion cells) were:

<u>Cell Means for 11X</u>:

# of 2-year GSA contracts = 11.82

# of 3-year GSA contracts = 13.78

# of 4-year GSA contracts = 19.91

Price of ACF option = $3,299

Price of EB option = $3,904

Hence, upon substituting costs of the above cell means in equation (4), one obtains:

$$\left.\frac{d(\ln C)}{d(\ln(\#\text{ of 2-year GSA contracts})}\right|\text{at cell means} = .456 \qquad (5)$$

Thus, a 1 percent increase in the goal for 2-year GSA contracts in 11X is forecasted to increase the total incentive cost for 11X by .456 percent. If one performs the same type of calculation for 3-year and 4- year GSA contracts, the elasticity (evaluated at the mean) for 3-year GSA contracts on the total 11X incentive cost is .292, and the elasticity for 4-year plus GSA contracts is .402.

Hence, a 1 percent increase in the total goal of GSA contracts for 11X, keeping the mix unchanged, is projected to increase the total incentive cost needed by 1.15 percent (the sum of the three elasticities). Note the increase in marginal costs, as expected due to the fixed supply of eligibles in the GSA pool.

2) Consider next the impact of a change in the local unemployment rate on GSA contract production for 11X. Since the unemployment rate decreased 1 percent, how much did the total GSA contract production for 11X change? Consider the elasticity, defined as:

$$\frac{d(\ln(\#\text{ of 2-year GSA contracts for 11X})}{d(\ln(\text{unemployment rate}))} \qquad (6)$$

But equation (6) is:

$$\frac{d(\ln(\#\text{ of 2-year GSA contracts})}{(\ln(\text{total incentive costs})} \times \frac{d(\ln(\text{total incentive costs})}{d(\ln(\text{unemployment rate}))}$$

The first term, evaluated at the mean, is 1/.456 (i.e., equation from (5), the reciprocal of the elasticity of incentive cost on 2-year production), or 2.192. The second term is .065 from table 8. Hence, the elasticity in equation (6) is .143. Repeating the calculation for 3-year and 4-year termers, we obtain respective elasticities of .223 and .162. Hence, the total elasticity on GSA contract production for 11X of the local unemployment rate (evaluated at the mean) is .528. This assumes that the mix of contracts stays the same. Note that total incentive costs are not fixed and that as the unemployment rate increased, there was more GSA contract production for 11X and more incentive costs were being expended. This elasticity for unemployment is in the general ballpark with other elasticity estimates from other types of studies.

3) In a similar fashion, one can investigate how competitive effects influence GSA contract production for 11X. Two types of competitive effects have been captured in the modeling. One is the goal for GSA contracts outside the MOS of focus. The intuition for this effect is that increasing GSA quotas outside the MOS of interest will lessen the effort being given to GSA contract production for 11X; hence, 11X contract production may well go down. This is indeed the case for 11X, with a negative sign for this type of competitive effect. The second competitive effect is the quota for all non-GSA contracts. Increasing these contracts may well dilute the effect being given to GSA contract production. Hence, we might also expect a negative effect sign for this type of competitive effect.

The type of computation needed to measure this impact is:

$$\frac{d(\ln(\text{\# of 2-year GSA contract production for 11X}))}{(\ln(\text{\# of non-GSA contracts})} \qquad (7)$$

or

$$\frac{d(\ln(\text{\# of 2-year GSA contract production for 11X})}{d(\ln(\text{incentive cost})} \times$$

$$\frac{d(\ln(\text{incentive cost})}{d(\ln(\text{non-GSA contract production})}^{[17]} = \frac{1}{.456} \times (-.037) = -.081$$

17. From equation (3) or table 8.

It should be mentioned that both types of competitive effects, while having the expected signs, are statistically insignificant for 11X. However, this is not the case for some of the other MOSs.

4) Consider the impact of making available for 11X the nonmonetary "unit of choice" option for GSA recruits with 4 or more years of service. (This indeed was the case in quarters 1, 2, 3, and 4, but not in quarters 5, 6, 7, or 8.) Then consider:

$$\frac{d(\ln(\#\text{ of 4-year or more GSA contracts for 11X}))}{d(\text{unit of choice availability})} \tag{8}$$

$$\frac{d(\ln(\#\text{ of 4-year or more GSA contracts for 11X}))}{d(\ln(\text{incentive cost}))} \times$$

$$\frac{d(\ln(\text{incentive costs}))}{d(\text{unit of choice availability})}^{[18]} = \frac{1}{.402} \times (.05) = .124$$

Exponentiating this figure, we arrive at the result that making the "unit of choice" option available for 4-year termers in 11X will increases the GSA contract production in this category by 1.132 recruits per cell. The average cell production of 4-year GSA recruits was 19.91. Hence, an increase of 5.68 percent in GSA supply is forecasted from use of this nonmonetary incentive mechanism.

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18. From equation (3), where we see the coefficient, .05, is statistically significant at reasonable levels of significance.

5) Consider the guidance counselor incentive, where he or she is awarded special points if the particular MOS is sold in the time period when the MOS has been selected for special attention. MOS 11X received this attention for all but the first quarter (January-March 1986), when the guidance counselor incentives were not in force because the program was not started until April 1986.

The calculation is as follows:

$$\frac{d(\ln(\#\text{ of 2-year GSA contracts})}{d(\text{application of special points})} \tag{9}$$

$$= \frac{d(\ln(\#\text{ of 2-year GSA contracts})}{d(\ln(\text{incentive cost})} \times$$

$$\frac{d(\ln(\text{incentive cost})^{[19]}}{d(\text{application of special points})} = \frac{1}{.456} \times .208 = .456$$

Exponentiating this figure, we get 1.578 more 2-year GSA contracts per cell. Similarly, calculations for 3-year and 4-year GSA contracts yield 2.04 and 1.677, respectively, more contracts, for a total of 5.295 more GSA contracts, an 11.64 percent increase per cell.

Hence, it is estimated that by putting 11X on the special priority MOS listing, earning guidance counselor awards, GSA contract production will increase by 11.64 percent.

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19. From equation (3).

6) Finally, consider the elasticity of the value of the EB (averaging \$3,904 for 11X) on GSA contract production for 3-and 4-year termers.

If one computes:

$$\frac{d(\ln(\#\text{ of 3-year GSA contracts obtained})}{d(\ln(\text{price of EB})} \qquad (10)$$

$$= \frac{d(\ln(\#\text{ of 3-year GSA contracts obtained})}{d(\ln(\text{incentive costs})} \times \frac{d(\ln(\text{incentive costs})}{d(\ln(\text{price of EB})} \qquad (11)$$

The first term of equation (11) has already been seen to be $\frac{1}{.292}$, the reciprocal of the elasticity of incentive costs on GSA contract production for 3-year termers.

Consider the second term of equation (11). Upon differentiating the cost equation (3) with respect to (ln(price of EB)), one obtains:

$$\frac{d(\ln(\text{incentive costs})}{d(\ln(\text{price of EB})} = .042 + .436 \ln(\text{price of EB})$$
$$-.435 \ln(\text{price of ACF})$$
$$-.11 \ln(\#\text{ of 2-year GSA contracts})$$
$$+.07 \ln(\#\text{ of 3-year GSA contracts})$$
$$+.07 \ln(\#\text{ of 4-year GSA contracts}) \qquad (12)$$

When evaluated at the overall means, equation (12) is .32. Hence, with a 1 percent change in the value of the EB, the overall increase in GSA contract production for 3-year termers for 11X is estimated to be:

$$\frac{1}{.292} \times .32 = 1.096\%$$

Performing the same calculation for 4-year GSA recruits and adding the result to that of 3-year recruits, we estimate that 1 percent increases in the EB bonus have been associated in the past with increases of about 1.89 percent in GSA contract production for 3- and 4-year termers for 11X. Note that the resulting incentive costs have also risen appreciably due to the higher per unit cost and the higher "take" rate. Table 10 summarizes the various elasticities for 11X.

3.4 Result of Exercising PC Software for 4th Quarter of CY87 for MOS 11X

Inputs

1) Projected DEP loss rate for period in question: 6 percent (this was actual for 11X over the 2-year period)
2) Goal: 2,263 actual unadjusted GSA contracts, the number of gross GSA contracts lesired (presumably this would be estimated from the net GSA contract goal, factored by the anticipated DEP loss factor)
3) Composition of Goal: 569 2-year recruits, 513 3-year recruits, and 1,181 4-year or more recruits (actual)
4) Competitive Effects
   a) GSA goal outside 11X: 13,834 (actually obtained)
   b) Number of non-GSA recruits: 11,041 (actually obtained)
5) "Unit of choice" available in that quarter? No (actual)
6) "Station of choice" available in that quarter? Yes
7) Number of recruiters in field: 5,024 (actual)

Table 10. Summary of key estimated elasticities for 11X (estimated at the mean of 9,830 GSA contracts for 11X per year, and an average mix of GSA contracts obtained for 11X over two years)

1) The elasticity of the total number of GSA contracts on incentive cost for 11X is 1.15, i.e., to increase the total number of GSA contracts by 1% (keeping the mix of 2-, 3-, and 4-year contracts the same), it is estimated that an increase of 1.15% in the total incentive costs for 11X is needed. Also, the elasticities for each term of service are increasing as the goals for each type of recruit are increased. The indicated elasticity for 2-year contracts is .456; for 3-year contracts, it is .292; and for 4-year or more contracts, the elasticity is .402.

2) The elasticity of the local unemployment rate on total GSA contract production for 11X (evaluated at the overall mean of 6.93% and keeping the mix of contracts constant) is .528, i.e., 1% decreases in the unemployment rate have been associated with .528% decreases in GSA contract production for 11X.

Note that from the 1st quarter to the 8th quarter, the average unemployment rate declined from 7.76% to 6.1%, a change of 22%. Hence, this change alone is forecasted to decrease the total number of GSA contracts obtained for 11X by 11.62%.

3) If one adds 11X to the monthly list of prioritized MOSs (those that earn special guidance counselor points if the MOS is sold in that month), it is forecasted that 11.64% more GSA contracts would be obtained.

4) The impact of the nonmonetary "unit of choice" option on 4-year term GSA contract production for 11X is estimated to be 5.68%. That is, making unit of choice available for 11X (for a 4-year or more term of service increases the number of GSA contracts in that term of service by 5.68%.

5) The competitive impact of increasing either the goal for GSA contracts in MOSs outside 11X or the goal for all non-GSA contracts (over all MOSs) is forecasted to have negative effects on the production of 11X contracts, as expected. However, it is not statistically significant for 11X.

6) Increasing the value of the EB for 11X (averaging $3,904 over the 2-year period) by 1% was associated with an increase in GSA contract production of 3- and 4-year termers for 11X by 1.89%, but, of course, with a substantial increase in incentive costs for 11X.

8) Average local unemployment rate across nation: 6.182 percent (actual)

9) Percent of GSA contracts anticipated to be sold off first 3 screens: 89.19 percent (actual)

10) Do special guidance counselor awards apply? Yes (actual)

11) Average price of EB for period in question: $3,500 (actual)

12) Average price of ACF: $3,249 (actual)

13) Size of QMA (nationally): 9.633 million (actual)

14) 4th quarter of calendar year

Given the preceding 14 inputs, the PC software would forecast a total budget of $4.29M needed for MOS 11X for the quarter if there were no attrition. (This is the amount shown on screen in the PC program.)[20] In comparison, using the actual weighted price of the ACF, the actual average price of the EB, and the mix of takers actually contracted for in this time period, the actual cost (with no attrition) would have been $4.328M. The projected adjusted cost, taking into account expected attrition from DEP loss, would then be 6 percent less, or $4.033M. Furthermore, the software program would forecast an efficient cost share of 18.8 percent for the EB option (the actual was 28.5 percent). It would also project that 231 EB takers (at the EB price of $3,500) and 1,072 ACF takers would be obtained (there were actually 364 EB takers and 936 ACF takers). Hence, the model would come up with almost exactly the same number of total takers as actually occurred, but it would do so at a somewhat lower cost.

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20. If the user inputs the desired GSA net contract goal into the PC software, the resulting cost shown on the screen is a good approximation of the actual real costs needed (as well as the split of ACF and EB expenditures). Alternatively, one can "factor" the net GSA contract goal by the DEP loss factor, obtain the projected costs (if all of these contracts experienced no attrition), and then reduce this cost by the DEP loss factor (since those attriting will not receive the incentives). The two approaches give the same answer if there are constant returns to scale operating.

4.0 TECHNICAL DEVELOPMENT OF THE ENLISTMENT INCENTIVE COST ALLOCATION MODEL

The model described below serves two related purposes: (1) as a purely descriptive, predictive tool, it is designed to "explain" the observed patterns of incentive costs and their allocation within a MOS; and (2) to identify any departures of observed from efficient cost and its allocation within that MOS, and to quantify the cost of any such departures. The "observed" pattern of incentive cost and its allocation refers to historical data by quarter and by recruiting battalion for the period of CY86-CY87 for each of eight MOS groupings. For each MOS grouping, the observed data consist of 8X54=432 observations or cells, capturing both temporal and geographical experience.

Very importantly, the model serves a predictive purpose, since it is capable of projecting out-of-sample values of incentive cost and its allocation. The projection can be based on a continuation of the allocation philosophy observed within the sample, or it can be based on a projection of the efficient incentive cost and its allocation, generated from observed sample data in a manner to be described below. The latter projection, of efficient behavior, is of primary interest.

The complete model consists of three equations: an incentive cost equation and a pair of equations expressing the allocation of incentive cost to its two component categories, the enlistment bonus (EB) and the Army College Fund (ACF). A minimum incentive cost equation for a particular MOS, built at the quarterly battalion level, can be written:

$$C = C(Y_1, Y_2, Y_3, Y_4, Y_5, P_1, P_2, N_1, N_2, Z_1, Z_2, Z_3, Z_4, Z_5, Q_1, Q_2, Q_3, T) \tag{13}$$

The variables are defined as follows:

Variable	Acronym	Definition
C	Cost	Total incentive cost* in the MOS
Y_1	Y_1	Total number of 2-year GSA contracts**
Y_2	Y_2	Total number of 3-year GSA contracts
Y_3	Y_3	Total number of contracts longer than 3 years
Y_4	OTHGSA	Total number of GSA contracts in other MOSs
Y_5	NONGSA	Total number of non-GSA contracts in all MOSs
P_1	PEB	Price for EB option
P_2	PACF	Price for ACF option (weighted across 2-, 3-, and 4-year takers)
N_1	STATIOND	Dummy variable for station of choice option (=1 if available)
N_2	UNITD	Dummy variable for unit of choice option (=1 if available)
Z_1	POINTS	Dummy variable for availability of guidance counselor points for selling the MOS (=1 if yes)
Z_2	RECRUIT	Number of recruiters
Z_3	QMA	Size of eligible population
Z_4	UNEMP	Local unemployment rate in battalion area
Z_5	PCPRES	Percent of GSA contracts for MOS of interest when MOS was sold off the first three screens by guidance counselors

* This is not adjusted for attrition in the delayed entry pool.

** For the purposes of budget generation or budget execution, this would be the goal. The model was built using the actual outcomes and resulting incentive costs.

Q_1	QD1	Dummy variable for 1st quarter of CY
Q_2	QD2	Dummy variable for 2nd quarter of CY
Q_3	QD3	Dummy variable for 3rd quarter of CY
T	YRD	Dummy variable for CY86
S_1	SHREB	P_1X_1/C = share of EB expenditures in total incentive cost
S_2	SHRACF	$P_2X_2/C = 1 - S_1$ = share of ACF expenditures in total incentive cost
X_1	EB	Number of takers of the EB benefit
X_2	ACF	Number of takers of the ACF benefit

For this model to be applied empirically, it is necessary to endow the minimum cost equation with a functional structure, and to specify an estimation technique. The structure should be sufficiently flexible so as to impose no properties on recruiting technology that are unwarranted by the data. It should also be sufficiently simple so as to be tractable empirically in light of the size of the database relative to the number of explanatory variables included.

A flexible second-order logarithmic specification, known as "translog," is attractive because comparative static effects are easily represented by elasticities, which facilitate comparisons across different experiments. The translog incentive cost equation for a MOS is written as:

$$
\begin{aligned}
C(.) = a_0 &+ \sum_{i=1}^{3} a_i \ln Y_i + a_4 \ln Y_4 + a_5 \ln Y_5 + \sum_{i=1}^{2} b_i \ln P_i \\
&+ \tfrac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} a_{ij} \ln Y_i \ln Y_j + \tfrac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} b_{ij} \ln P_i \ln P_j \\
&+ \sum_{i=1}^{3} \sum_{j=1}^{2} g_{ij} \ln Y_i \ln P_j + \sum_{i=1}^{2} d_i N_i + e_1 Z_1 \\
&+ \sum_{i=2}^{5} e_i \ln Z_i + \sum_{i=1}^{3} q_i Q_i + tT
\end{aligned}
\tag{14}
$$

Note that equation (14) is log-quadratic in (Y_1, Y_2, Y_3, P_1, P_2) and log-linear or linear in the remaining variables. Thus, the total incentive cost in a MOS is influenced primarily by the number and length of term of enlistments desired in that MOS, by competitive effects associated with the GSA goal outside the MOS as well as the goal for all non-GSA contracts, by the per unit cost of each of the two monetary incentives (EB and ACF), and also by a host of other recruiting variables. Some of the last are other Army resources and variables that characterize the environment in which recruiting takes place.

It is possible to estimate equation (14) by itself. However, in order to improve efficiency in estimation, we add a set of subsidiary equations to equation (14). A fundamental principle in mathematical programming states that the effect on the optimal value of the objective function of a slight relaxation of a constraint is equal to the optimal value of the endogenous variable whose constraint is relaxed. In the present context, this principle means that the effect on minimized incentive cost of a change in the unit cost of an incentive

equals the optimal utilization of the incentive whose unit cost changes.[21] Since the minimum incentive cost function in equation (14) is logarithmic, this principle equivalently[22] means that the optimal fraction of total incentive cost for a MOS that should be allocated to the i-th monetary incentive is given by:

$$S_i(.) = d(\ln C(.))/d(\ln P_i)$$

$$= b_i + \sum_{j=1}^{2} b_{ij} \ln P_j + \sum_{j=1}^{3} g_{ji} \ln Y_j , \quad i = 1,2 \tag{15}$$

where the parameters of equation (15) are the same as those of equation (14).

---

21. This result, known as Shepard's Lemma, can be stated mathematically as $\frac{dC}{dP} = X_i{*}$.

22. Since $\frac{dC}{dP} = X_i{*}$, then $\frac{dC}{C} \div \frac{dP_i}{P_i} = \frac{P_i X_i}{C}$, but the left side is the elasticity of C on P_i or, equivalently, $\frac{d(\ln C)}{d(\ln P_i)}$.

The system (14), (15) describes the determination of efficient incentive allocation $S_i(.)$ and the minimum cost $C(.)$ of achieving the efficient allocation. However, the dependent variables on the left sides of (14), (15) are unobserved; we observe actual incentive allocation $P_i X_i / C$, $i=1,2$, and its cost $C=P_1 X_2 + P_2 X_2$.

The real problem, therefore, is to rewrite the system (14), (15) in terms of observed, possibly inefficient, incentive allocation and its cost. Solution of this problem will provide a model suitable for estimation; it will also generate measures of the direction, magnitude, and cost of inefficient incentive allocation.

We begin by rewriting (14), (15) in terms of observed values of incentive cost and its allocation in a MOS as:

$$\begin{aligned} C = a_0 &+ \sum_{i=1}^{3} a_i \ln Y_i + a_4 \ln Y_4 + a_5 \ln Y_5 + \sum_{i=1}^{2} b_i \ln P_i \\ &+ \tfrac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} a_{ij} \ln Y_i \ln Y_j + \tfrac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} b_{ij} \ln P_i \ln P_j \\ &+ \sum_{i=1}^{3} \sum_{j=1}^{2} g_{ij} \ln Y_i \ln P_j + \sum_{i=1}^{2} d_i N_i + e_1 Z_1 \\ &+ \sum_{i=2}^{5} e_i \ln Z_i + \sum_{i=1}^{3} q_i Q_i + tT + u_0 \end{aligned} \tag{16}$$

$$S_i = b_i + \sum_{j=1}^{2} b_{ij} \ln P_j + \sum_{j=1}^{3} g_{ji} \ln Y_j + u_i, \; i=1,2 \tag{17}$$

The left sides of (16), (17) are observed values of incentive cost and its allocation. The right sides, exclusive of the error terms u_0 and u_i, are seen from (14), (15) to be the efficient values of incentive cost and its allocation. The error terms represent the differences between the two, these differences being attributable to both inefficiencies in the incentive allocation process and the "noise" that appears in all such empirical relationships (due to omitted variables, misspecification, etc.).

We allow for allocative inefficiencies by assuming that $E(u_0) = \theta \gtreqless 0$, $i=1,2$, so that incentive X_i can be systemmatically overutilized ($\theta_i > 0$), efficiently utilized ($\theta_i = 0$), or systemmatically underutilized ($\theta_i < 0$). Since even inefficient shares sum to unity, $\theta_1 + \theta_2 = 0$, the cost of allocative inefficiency is nonnegative, and so the systemmatic component of u , call it θ_0, is nonnegative. The easiest way to estimate (16), (17) is to merge the systemmatic allocative inefficiencies (θ_0) with their respective intercepts (b_i), and merge the cost of the allocative inefficiencies (θ_0) with the cost equation intercept (a_0), to yield the system:

$$
\begin{aligned}
\ln C = {} & (a_0 + \theta_0) + \sum_{i=1}^{3} a_i \ln Y_i + a_4 \ln Y_4 + a_5 Y_5 + \sum_{i=1}^{2} b_i \ln P_i \\
& + \tfrac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} a_{ij} \ln Y_i \ln Y_j + \tfrac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} b_{ij} \ln P_i \ln P_j \\
& + \sum_{i=1}^{3} \sum_{j=1}^{2} g_{ij} \ln_i \ln P_j + \sum_{i=1}^{2} d_i N_i + e_1 Z_1 \\
& + \sum_{i=2}^{5} e_i \ln Z_i + \sum_{i=1}^{3} q_i Q_i + tT + (u_0 - \theta_0)
\end{aligned}
\qquad (18)
$$

$$S_i = (b_i + \theta_i) + \sum_{j=1}^{2} b_{ij} \ln P_j + \sum_{j=1}^{3} g_{ji} \ln Y_j + (u_i - \theta_i), \; i = 1,2 \qquad (19)$$

Note that now $E(u_0 - \theta_0) = E(u_i - \theta_i) = 0$, $i=1,2$ by construction. We can now evaluate the efficiency of previous incentive allocations with the help of equations (18), (19), and figure 2. Observed incentive cost shares are given by the left sides of (19). Observed incentive usage (X_1, X_2) is located at point A in figure 2; the cost of this allocation is C, and it generates Y $(=Y_1+Y_2+Y_3)$ GSA contracts. Estimated incentive cost shares are given by the right sides of (19). Estimated allocative inefficiencies θ_i are obtained by subtracting the estimates of the b_i obtained from (18) from the estimated intercepts of (19). Estimated efficient cost shares are obtained by subtracting the θ_i from the right sides of (19). From these estimated efficient incentive cost shares, estimated efficient incentive usages for observed expenditure level C are obtained as $\hat{X}_i = (C/P_i)$ multiplied by (estimated efficient incentive cost share), $i=1,2$. In figure 2, the efficient way to allocate observed expenditure C is indicated by $(\hat{X}_1, \hat{X}_2)$, located at point B. This efficient allocation of incentives generates more GSA contracts $(\hat{Y}>Y)$ from the same expenditure C.

One measure of the efficiency of incentive allocation is $(Y/\hat{Y})$, the ratio of observed to maximum GSA contracts obtained from observed incentive expenditure. However, we have modeled the Army as trying to minimize the cost of meeting given recruiting goals. In this case, the same efficiency ratio $(Y/\hat{Y})$ can be applied to observed expenditure to obtain an equivalent measure of the efficiency of incentive allocation $\frac{1}{M}$, namely, the efficient cost to obtain observed contracts Y. Thus, $(Y/\hat{Y})(C) = C(.)$ is the estimated minimum incentive

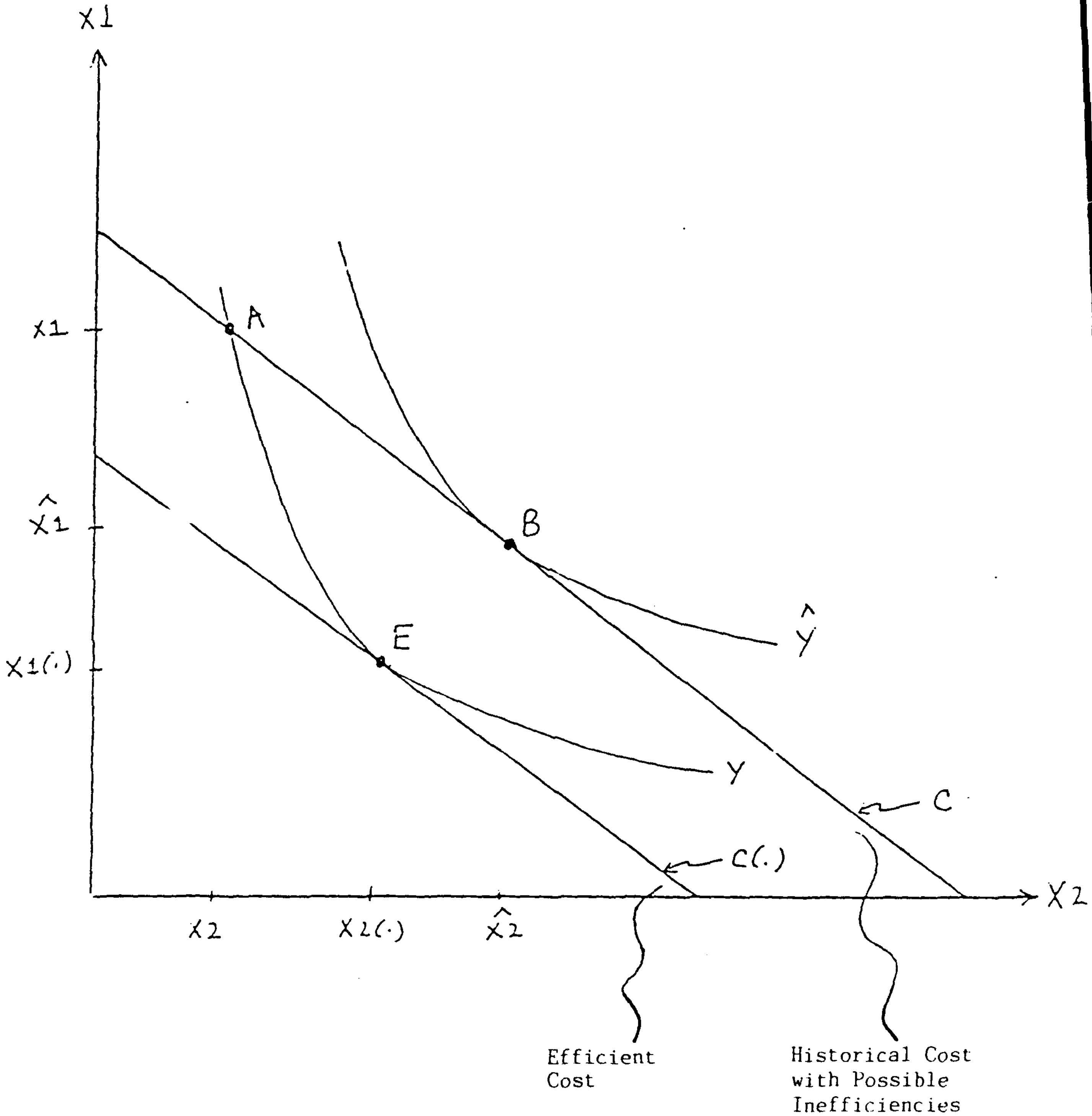

Figure 2. The efficiency of incentive allocation

budget capable of generating observed contracts Y in the specified recruiting environment. This minimum cost requires efficient incentive usages $X_1(.)$ and $X_2(.)$. In figure 2, the efficient way to generate observed contracts Y is located at point E, where C(.) is allocated efficiently to $X_1(.)$ and $X_2(.)$.

Finally, the procedure enables us to obtain an estimate of θ_0 via $\theta_0 = \ln(C/C(.))$. This provides a complete comparison of observed and estimated efficient values of incentive cost shares, incentive usages, and incentive cost. The technique works, i.e., it is able to generate efficient behavior from observed (possibly inefficient) data by generating separate estimates of the parameters describing recruiting technology and the parameters describing over- or underutilization of monetary incentives relative to the cost of using those incentives.

Equations (18) and (19) constitute a system of three equations, a cost equation and two incentive-share equations. However, because incentive cost shares sum to unity, one cost-share equation is redundant, leaving two independent equations to be estimated. Parameters in the deleted incentive cost-share equation are obtained from the following "adding-up" restrictions (associated with price homogeneity):

$$b_1 + b_2 = 1$$
$$b_{11} + b_{21} = 0$$
$$b_{12} + b_{22} = 0$$
$$g_{11} + g_{12} = 0$$
$$g_{21} + g_{22} = 0$$
$$g_{31} + g_{32} = 0$$

Writing the system (18), (19) in compact form, we have:

$$Y = XB + e \tag{21}$$

where Y is a vector of observed dependent variables, X is a matrix of explanatory variables, B is a parameter vector constrained by (20) to be estimated, and e is a disturbance vector. The disturbance vector is assumed to satisfy:

$$E(e) = 0$$
$$E(ee') = \Sigma \circ I \tag{22}$$

where $\circ$ denotes the Kronecker product and $\Sigma = (\sigma ij)$ is a 2*2 symmetric and positive definite matrix. Nonzero off-diagonal elements of signal-correlated disturbances across equations suggest that the equations in the system are only "seemingly unrelated," being related through their disturbances terms, perhaps as a consequence of omitted variables.

As noted above, the parameters of the system can be estimated by ordinary least squares applied to each equation separately. Under assumptions (22), the parameter estimates are unbiased (apart from the cost equation intercept) and consistent. They are not efficient, however, because they ignore the interdependence among equations caused by correlated disturbances. Therefore, a systems estimator is needed. Several are available, the most popular of which is Zellner's "Seemingly Unrelated Regressions" technique. In this two-step method, each equation is estimated separately by ordinary least squares, after which the ordinary least squares residuals are used to form a consistent estimator $\tilde{\Sigma}$ of Σ. Second-stage parameter estimates based on $\tilde{\Sigma}$ are unbiased

(again, apart from the cost equation intercept, which is biased upward), consistent, and asymptotically efficient. Estimation of the model is carried out using PROC SYSLIN on SAS.

5.0 SUMMARY OF RESULTS FOR THE OTHER SEVEN MOS GROUPINGS

Section 3.0 was devoted to a detailed analysis of MOS 11X. The following subsections summarizes the findings for each of the other seven MOS groupings; the format of the tables presented is identical to that used for 11X to facilitate interpretation of results.

Table 11 is a summary of the estimated improvement (either in terms of dollars that could have been saved or more GSA contracts for the same level of expenditures) if the mix of EB versus ACF expenditures had been optimal. Note that overall a 2.9 percent reduction (about $8.4M) in incentive expenditures might have been possible with perfect hindsight as to the recruiting environment to be dealt with and other such factors. Alternatively, about an additional 2,973 GSA contracts (about a 1.98 percent increase) might have been possible at the same level of expenditures. Also note that the recommended overall use of the EB benefit would be down about nine percentage points (from 32.5 percent to 23.5 percent).

Consider next a summary of the results for the other MOS groups. For MOS 12B (Combat Engineer) (tables 12 and 13), the model suggests that the average eight-quarter historical EB utilization level of 13.5 percent was too high. The actual average EB shares by quarter were 40.5 percent, 29.2 percent, 21.4 percent, 12.2 percent, and 0 percent for the last four quarters (EBs were not available then). Using the calculations for the 1st quarter of CY86 for the

Table 11. Summary of allocation findings by MOS (CY86-CY87)

MOS	Actual Number of GSA Recruits Contracted	Related Actual Incentive Cost	Estimated Minimum Cost for Same Number of GSA Contracted	Estimated Increase in GSA Contracts Possible at Same Level of Expenditures	Change in Average EB Utilization Recommended
11X (Infantry)	19,660	$ 58.311M	$ 54.76M	1,377	45.4% down to 22.3%
12B (Combat Engineer)	3,145	8.072M	7.83M	97	13.5% down to 2%
13B (Canon Crewman)	5,664	24.085M	20.81M	906	69.1% down to 58.1%
13F (Fire Support Spec)	1,665	4.862M	4.754M	38	33.8% down to 0%
19D (Cavalry Scout)	2,215	6.594M	6.248M	122	24.2% down to 0%
19K/19X (Armor Crewman)	2,907	9.509M	8.89M	203	36.6% up to 43.1%
All Remaining Combat Arms MOSs	7,163	18.69M	18.66M	14	26.4% down to 15.5%
All non-Combat Arms MOSs	108,010	157.278M	157.12M	216	23.99% down to 21.99%
Total Over All MOSs	150,389	$287.401M	$279.072M (2.9% reduction)	2,973 (1.98% increase)	32.5% down to 23.5% (dollar weighted)

Table 12. Summary of actual experience for MOS 12B (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	395	2,162	593	3,145
DEP Loss Factor	8.7%	5.1%	7.2%	5.95%
Number of ACF Takers	375	1,514	55	1,944 @ avg of $3,600
Number of EB Takers	0	17	439	456 @ avg of $2,451
Percent of GSA Recruits Receiving ACF or EB	95%	70.8%	83.3%	76.3%
Total Cost	$1.083M	$5.71M	$1.283M	$8.0725M
Actual Cost Share for EB	0%	0.8%	83.2%	13.2%
Average Cost/ GSA Contract	$ 2,742	$ 2,641	$ 2,164	$ 2,567

Table 13. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for MOS 12B (Jan. 1986-Dec. 1987) (to deliver actual total of 3,145 GSA contracts, broken down to 395 for 2-year, 2,162 for 3-year, and 593 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS on EBs Over 8 Quarters	Number of GSA Contracts
Related Incentive Expenditure (actual)	$8.072M	13.15%	3,145
Average of EB and Range	$2,451 ($1,500-3,500)	13.15%	3,145
Predicted Cost (based on history only, ignoring inefficiencies)	$7.922M	13.5%	3,145
Predicted Efficient Cost*	$7.83M	2% (actual in last quarter was 0%)	3,145
Estimated Overall Percent Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period*	--	2%	3.1% (97 contracts)

* This is based on results for the 1st quarter of CY86 only; for this MOS, the EB was not offered in quarters 5, 6, 7, and 8.

projections, the actual optimal average EB utilization would be estimated to be 2 percent, down from the actual of 40.5 percent (indeed, 0 percent was the actual situation for all of CY87). Using the 1st quarter of CY86 as the base, the model estimates that about 3.1 percent more GSA contracts would have been obtained in 12B had the allocation been optimal; this projects to a dollar saving over the eight quarters of about $0.24M.

For 13B (Canon Crewman) (tables 14 and 15), the model suggests that the average historical EB utilization level of 69.1 percent was too high; the optimal average EB utilization is estimated to be 58.1 percent (the actual for the 4th quarter of CY87 was 31.6 percent). The model estimates about 16 percent more GSA contracts could have been obtained or about $3.2M (16 percent) saved had the allocations been optimal.

For 13F (Fire Support Specialist) (tables 16 and 17), the model estimates that the average historical EB utilization level of 33.8 percent was too high; indeed, the optimal average utilization is estimated to be all ACF (for the last quarter of CY87, EB utilization was 15.2 percent). The model estimates that about 2.3 percent more GSA contracts could have been obtained or about $0.11M saved.

For 19D (Cavalry Scout) (tables 18 and 19), the model estimates that the average historical EB utilization rate of 24.2 percent was too high; here, too, the optimal average utilization is estimated to be all ACF (for the last quarter of CY87, EB utilization was 19.8 percent). The model estimates that about 5.5 percent more GSA contracts could have been obtained or about $0.35M saved.

For 19K/19X (Armor Crewman in M1 or M60 tank) (tables 20 and 21), the model estimates that the average historical EB utilization of 36.6 percent was too low; indeed, the optimal average utilization is estimated to be 43.1 percent.

Table 14. Summary of actual experience for MOS 13B (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	1,004	1,598	3,062	5,664
DEP Loss Factor	6.9%	4.5%	5.5%	5.5%
Number of ACF Takers	969	579	120	1,668 @ avg of $3,278
Number of EB Takers	0	734	2,724	3,458 @ avg of $4,881
Percent of GSA Recruits Receiving ACF or EB	96.5%	82.2%	92.9%	90.5%
Total Cost	$2.798M	$4.88M	$16.41M	$24.085M
Actual Cost Share for EB	0%	55.6%	97.2%	69.1%
Average Cost/ GSA Contract	$ 2,787	$ 3,054	$ 5,359	$ 4,252

Table 15. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for MOS 13B (Jan. 1986-Dec. 1987) (to deliver actual total of 5,664 GSA contracts, broken down to 1,004 for 2-year, 1,598 for 3-year, and 3,062 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS on EBs Over 8 Quarters	Number of GSA Contracts
Related Incentive Expenditures (actual)	$24,085M	69.1%	5,664
Average of EB and Range	$4,881 ($3,000-7,000)	69.1%	5,664
Predicted Cost (based on history only, ignoring inefficiencies)	$23.94M	69.1%	5,664
Predicted Efficient Cost	$20.81M	58.1% (actual in last quarter was 31.6%)	5,664
Estimated Overall Percent Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	58.1%	16% (906 contracts)

Table 16. Summary of actual experience for MOS 13F (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	585	527	557	1,665
DEP Loss Factor	6.14%	6.8%	3.6%	5.5%
Number of ACF Takers	553	351	97	1,001 @ avg of $3,278
Number of EB Takers	0	84	401	485 @ avg of $3,254
Percent of GSA Recruits Receiving ACF or EB	94.5%	82.5%	89.4%	89.2%
Total Cost	$1.597M	$1.547M	$1.718M	$4.862M
Actual Cost Share for EB	0%	14.9%	78.0%	33.8%
Average Cost/ GSA Contract	$ 2,730	$ 2,935	$ 3,084	$ 2,920

Table 17. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for MOS 13F (Jan. 1986-Dec. 1987) (to deliver actual total of 1,665 GSA contracts, broken down to 585 for 2-year, 527 for 3-year, and 557 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Spent on EBs Over 8 Quarters	GSA Contracts
Related Incentive Expenditure (actual)	$4.862M	33.8%	1,665
Average of EB and Range	$3,254 ($2,000-4,000)	33.8%	1,665
Predicted Cost (based on history only, ignoring inefficiencies)	$4.886M	34.8%	1,665
Predicted Efficient Cost	$4.754M	0% (actual in last quarter was 15.2%)	1,665
Estimated Overall Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	0%	2.27% (38 contracts)

Table 18. Summary of actual experience for MOS 19D (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	704	733	781	2,215
DEP Loss Factor	2.7%	4.2%	3.1%	3.3%
Number of ACF Takers	688	585	137	1,410 @ avg of $3,336
Number of EB Takers	0	19	522	541 @ avg of $2,686
Percent of GSA Recruits Receiving ACF or EB	97.7%	83.4%	84.3%	88.1%
Total Cost	$1.987M	$2.267M	$2.340M	$6.594M
Actual Cost Share for EB	0%	3.2%	77.2%	24.2%
Average Cost/ GSA Contract	$ 2,822	$ 3,093	$ 2,996	$ 2,977

Table 19. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for MOS 19D (Jan. 1986-Dec. 1987) (to deliver actual total of 2,215 GSA contracts, broken down to 704 for 2-year, 733 for 3-year, and 781 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Spent on EBs Over 8 Quarters	GSA Contracts
Related Incentive Expenditure (actual)	$6.594M	24.2%	2,215
Average of EB and Range	$2,686 ($1,500-4,000)	24.2%	2,215
Predicted Cost (based on history only, ignoring inefficiencies)	$6.642M	24.2%	2,215
Predicted Efficient Cost	$6.248M	0% (actual in last quarter was 19.8%)	2,215
Estimated Overall Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	0%	5.53% (122 contracts)

Table 20. Summary of actual experience for MOS 19K/19X (Jan. 1986-Dec. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	990	697	1,223	2,907
DEP Loss Factor	4.5%	4.6%	6.8%	5.5%
Number of ACF Takers	963	406	342	1,711 @ avg of $3,264
Number of EB Takers	0	261	742	1,003 @ avg of $3,383
Percent of GSA Recruits Receiving ACF or EB	97.3%	95.6%	88.6%	93.4%
Total Cost	$2.781M	$2.268M	$4.46M	$9.509M
Actual Cost Share for EB	0%	32.8%	70.1%	36.5%
Average Cost/ GSA Contract	$ 2,809	$ 3,254	$ 3,646	$ 3,271

Table 21. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for MOS 19K/19X (Jan. 1986-Dec. 1987) (to deliver actual total of 2,907 GSA contracts, broken down to 990 for 2-year, 697 for 3-year, and 1,223 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Spent on EBs Over 8 Quarters	GSA Contracts
Related Incentive Expenditure (actual)	$9.509M	36.6%	2,907
Average of EB and Range	$3,383 ($1,500-7,000)	36.6%	2,907
Predicted Cost (based on history only, ignoring inefficiencies)	$9.431M	36.8%	2,907
Predicted Efficient Cost	$8.89M	43.1% (actual in last quarter was 23%)	2,907
Estimated Overall Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	43.1%	6.98% (203 contracts)

Further, the model estimates that about 7 percent more GSA contracts could have been obtained or about $0.6M saved.

For the grouping consisting of 23 small Combat Arms MOSs (referred to as 888) (tables 22 and 23), the average EB utilization of 26.4 percent is estimated to be too high; the optimal average EB utilization is estimated to be 15.5 percent (the actual for the last quarter of CY87 was 8.1 percent). The change is estimated to produce 0.2 percent more GSA contracts or lower cost by $0.03M.

For the group consisting of all non-Combat Arms MOSs (tables 24 and 25), the average historical EB utilization of 23.99 percent is estimated to be too high. It is estimated that the optimal average EB utilization should have been 21.99 percent, which is estimated to produce 0.2% more GSA contracts or save about $0.15M.

Table 22. Summary of actual experience for merging of 23 small Combat Arms MOSs (Jan. 1986-Ded. 1987)

	2-Year Term	3-Year Term	4 Years or Over	Total
Number of GSA Contracts (gross)	1,439	2,785	2,909	7,133 (22,869 GSA Active Duty man years)
DEP Loss Factor	7.4%	4.9%	5.0%	5.5%
Number of ACF Takers	1,315 @ $2,888	1,775 @ $3,750	700 @ $3,895	1,578 @ avg of $3,477
Number of EB Takers	0	30 @ avg of $1,933	1,548 @ avg of $3,525	1,548 @ avg of $3,526
Percent of GSA Recruits Receiving ACF or EB	91.4%	64.8%	77.3%	70.9%
Total Cost	$3.798M	$6.714M	$ 8.183M	$18.694M
Avg Actual Cost Share for EB	0%	0.9%	66.7%	26.4%
Average Cost/ GSA Contract	$ 2,036	$ 2,411	$ 2,813	$ 2,621
Average Cost/ GSA Active Duty Man Year	$ 1,018	$ 803	$ 703	$ 817

Table 23. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for merging* of 23 small Combat Arms MOSs (Jan. 1986-Dec. 1987) (to deliver actual total of 7,133 GSA contracts, broken down to 1,439 for 2-year, 2,785 for 3-year, and 2,909 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Spent on EBs Over 8 Quarters	GSA Contracts
Related Incentive Expenditure (actual)	$18.69M	26.4%	7,163
Average of EB and Range	$3,526 ($1,500-6,000)	26.4%	7,163
Predicted Cost (based on history only, ignoring inefficiencies)	$18.39M	26.4%	7,163
Predicted Efficient Cost	$18.66M	15.5% (actual in last quarter was 8.1%)	7,163
Estimated Overall Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	15.5%	.2% (14 contracts)

* Includes 11B, 11C, 11H, 11M, 12C, 12F, 13C, 13E, 13M, 13N, 13P, 13R, 15E, 16H, 16J, 16P, 16R, 16S,16X, 19E, 21G, 82C, and 93F.

Table 24. Summary of actual experience for aggregation of all non-Combat Arms MOSs (Jan. 1986-Dec. 1987)

	2-Year	3-Year	4 Years or More	Total
Number of GSA Contracts (gross)	16,907	37,640	53,463	108,010
DEP Loss Factor	8.6%	7.74%	7.93%	7.98%
Number of ACF Takers	13,581	15,368	5,422	34,371 @ $ 3,507
Percent of GSA Recruits Receiving ACF or EB	80.3%	41.3%	30.7%	42.2%
Total Cost	$39.22M	$57.98M	$60.08M	$157.278M
Average Actual Cost Share for EB	0%	1.7%	64.85%	21.3%
Average Cost/GSA Contract	$2,320	$1,540	$1,124	$1,456

Table 25. Comparison of actuals, historical prediction, and predicted efficient for costs and fraction spent on EBs for all non-Combat Arms MOSs (Jan. 1986-Dec. 1987) (to deliver actual total of 108,010 GSA contracts, broken down to 16,907 for 2-year, 37,640 for 3-year, and 53,463 for 4-year or more GSA contracts)

	Total Cost for MOS	Average Fraction of Total Expenditures for MOS Spent on EBs Over 8 Quarters	GSA Contracts
Related Incentive Expenditure (actual)	$157.278M	23.99%	108,010
Average of EB and Range	$3,940 ($1,500-8,000)	23.99%	108,010
Predicted Cost (based on history only, ignoring inefficiencies)	$153.048M	24.04%	108,010
Predicted Efficient Cost	$157.12M	21.99% (actual in last quarter was 27.5%)	108,010
Estimated Overall Increase in GSA Contracts Possible at Actual Level of Expenditure for Same Time Period	--	21.99%	0.2% (216 contracts)

6.0 APPENDIXES

A. Breakdown of GSA enlistments Contracted for Over CY86-87 by combat arms MOS (150,389 total gross GSA contracts)

The ones underlined are the six individual MOSs studied plus the two catchalls.

MOS	Percent of Total GSA Contracts
11B	0.5
11C	0.1
11H	0.1
11M	0
11X	13.1
12B	2.1
12C	0.3
12F	0.1
13B	3.8
13C	0.1
13E	0.6
13F	1.1
13M	0.3
13N	0.2
13P	0
13R	0.1
15E	0.4
16H	0.2
16J	0
16P	0.1
16R	0.3
16S	0.4
16X	0.4
19D	1.5
19E	0.3
19K	1.1
19X	0.8
21G	0.1
82C	0.3
93F	0.1
All non-Combat Arms MOSs	71.8

B. Individual Simultaneous Equation Regression Results for MOS 12B, 13B, 13F, 19D,19K/19X; Aggregation of All Remaining Combat Arms MOSs (Referred to as MOS 888); Aggregation of All non-Combat Arms MOSs (Referred to as MOS 999)

MOS 12B: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.01305 WITH 784 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.776302

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEPT	-0.16929	0.54056548	-0.313
LY1	0.28083365	0.03108303	9.035
LY2	0.34677592	0.02073929	16.721
LY3	0.22157388	0.02637467	8.401
LPEB	0.01802498	0.16160033	0.112
LPACF	0.98197502	0.16160033	6.077
LY1SQ	0.08174111	0.01541525	5.303
LY2SQ	0.14124479	0.00972891	14.518
LY3SQ	0.0596097	0.01375974	4.332
LY1Y2	-0.0225135	0.004605021	-4.889
LY1Y3	-0.0011847	0.0032285	-0.367
LY2Y3	-0.0376347	0.004265404	-8.823
LPACFSQ	0.17343168	0.030554	5.676
LPEBSQ	0.17343168	0.030554	5.676
LPAPEB	-0.173432	0.030554	-5.676
LPAY1	0.004578345	0.003060331	1.496
LPAY2	0.04678769	0.004942631	9.466
LPAY3	-0.0454672	0.002950569	-15.410
LPEBY1	-0.00457834	0.003060331	-1.496
LPEBY2	-0.0467877	0.004942631	-9.466
LPEBY3	0.04546719	0.002950569	15.410
LOTHGSA	0.05488148	0.07927309	0.692
LNONGSA	0.02969811	0.0722933	0.411
STATIOND	-0.21441	0.03908191	-5.486
LRECRUIT	0.00003123879	0.02160073	0.001
POINTS	-0.451253	0.11855036	-3.806
LQMA	-0.0587459	0.07868925	-0.747
LUNEMP	-0.0984291	0.06738921	-1.461
LPCPRES	0.00894949	0.005322877	1.681
QD1	0.06082254	0.07422752	0.819
QD2	0.07051531	0.0639411	1.103
QD3	0.41664277	0.05488056	7.592
YRD	0.66000668	0.07521371	8.775

MOS 12B: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.31703819	0.01463[illegible]5	21.667
LPACF	-0.173432	0.030554	-5.676
LPEB	0.17343168	0.030554	5.676
LY1	-0.00457834	0.003060331	-1.496
LY2	-0.0467877	0.004942631	-9.466
LY3	0.04546719	0.002950569	15.410

MOS 13B: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.07696 WITH 833 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.917524

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.97363006	0.28155437	3.458
LY1	0.22884390	0.01284535	17.815
LY2	0.22810095	0.01184844	19.252
LY3	0.34050662	0.009154289	37.196
LOTHGSA	0.07238445	0.04073119	1.777
LPEB	0.29157838	0.09586981	3.041
LPACF	0.70842162	0.09586981	7.389
LY1SQ	0.06307375	0.005658461	11.147
LY2SQ	0.07743594	0.005457068	14.190
LY3SQ	0.13047971	0.004866933	26.809
LY1Y2	-0.0119109	0.002026708	-5.877
LY1Y3	-0.0234162	0.002669569	-8.772
LY2Y3	-0.0363151	0.002626861	-13.825
LPACFSQ	0.48024404	0.0302805	15.860
LPEBSQ	0.48024404	0.0302805	15.860
LPAPEB	-0.0480244	0.0302805	-15.860
LPAY1	0.04849486	0.003340674	14.516
LPAY2	-0.0197324	0.00440498	-4.480
LPAY3	-0.0547746	0.005669941	-9.661
LPEBY1	-0.0484949	0.003340674	-14.516
LPEBY2	0.01973238	0.00440498	4.480
LPEBY3	0.05477463	0.005669941	9.661
LNONGSA	-0.0230186	0.03937763	-0.585
STATIOND	-0.0445343	0.029682	-1.500
UNITD	0.06374644	0.03458825	1.843
LRECRUIT	-0.00861706	0.01127903	-0.764
POINTS	0.11030996	0.04363191	2.528
LQMA	0.02690531	0.04325941	0.622
LUNEMP	0.0961888	0.03592107	2.678
LPCPRES	0.01687346	0.004795979	3.518
QD1	0.15430596	0.03805525	4.055
QD2	-0.0688619	0.0390806	-1.762
QD3	-0.0876714	0.03524072	-2.488
YRD	0.25060263	0.05988989	4.184

MOS 13B: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.40707933	0.01413198	28.806
LPACF	-0.480244	0.0302805	-15.860
LPEB	0.48024404	0.0302805	15.860
LY1	-0.0484949	0.003340674	-14.516
LY2	0.01973238	0.00440498	4.480
LY3	0.05477463	0.005669941	9.661

MOS 13F: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.3039 WITH 719 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.823887

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	1.21437539	0.40968743	2.964
LY1	0.35620703	0.01906159	18.687
LY2	0.29986912	0.2040605	14.695
LY3	0.32925234	0.01954471	16.846
LPEB	0.0732105	0.12929473	0.566
LPACF	0.92678950	0.12929473	7.168
LY1SQ	0.13350281	0.009361108	14.261
LY2SQ	0.11220237	0.009928384	11.301
LY3SQ	0.11556907	0.009624144	12.008
LY1Y2	-0.0227077	0.00215493	-10.538
LY1Y3	-0.0226059	0.002442907	-9.254
LY2Y3	-0.0144977	0.002224679	-6.517
LPACFSQ	0.44279977	0.06136391	7.216
LPEBSQ	0.44279977	0.06136391	7.216
LPAPEB	-0.4428	0.06136391	-7.216
LPAY1	0.07003735	0.004076215	17.182
LPAY2	-0.00175124	0.004024402	-0.435
LPAY3	-0.0620148	0.004069471	-15.239
LPEBY1	-0.0700374	0.004076215	-17.182
LPEBY2	0.001751243	0.004024402	0.435
LPEBY3	0.06201481	0.004069471	15.239
LOTHGSA	-0.00845189	0.05808976	-0.145
LNONGSA	-0.0723518	0.05445478	-1.329
STATIOND	-0.143521	0.05439353	-2.639
UNITD	0.03548238	0.04015802	0.884
LRECRUIT	-0.0049711	0.01807104	-0.275
POINTS	-0.0157583	0.03428748	-0.460
LQMA	0.0778431	0.06352346	1.225
LUNEMP	-0.0237464	0.05047048	-0.471
LPCPRES	0.002179702	0.004644936	0.469
QD1	0.02600313	0.04175101	0.623
QD2	-0.00800678	0.04306834	-0.186
QD3	0.04461473	0.03752808	1.189
YRD	0.13695381	0.04620827	2.964

MOS 13F: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.34435076	0.0129941	26.501
LPACF	-0.4428	0.06136391	-7.216
LPEB	0.44279977	0.06136391	7.216
LY1	-0.0700374	0.004076215	-17.182
LY2	0.001751243	0.004024402	0.435
LY3	0.06201481	0.004069471	15.239

MOS 19D: SIMULTANEOUS REGRESSION RESULTS ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.10657 WITH 740 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.855274

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	-0.191732	0.46112806	-0.416
LY1	0.37496360	0.01841899	20.357
LY2	0.30849596	0.01763027	17.498
LY3	0.30011040	0.0173165	17.331
LPEB	-0.204293	0.13548573	-1.508
LPACF	1.20429296	0.13548573	8.889
LYF1SQ	0.13976543	0.009300351	15.028
LY2SQ	0.11666518	0.008901403	13.106
LY3SQ	0.10030972	0.008880981	11.295
LY1Y2	-0.0188287	0.002576806	-7.307
LY1Y3	-0.0229081	0.002646214	-8.657
LY2Y3	-0.0161775	0.002281993	-7.089
LPACFSQ	0.31871674	0.01738696	18.331
LPEBSQ	0.31871674	0.01738696	18.331
LPAPEB	-0.0318717	0.01738696	-18.331
LPAY1	0.04169162	0.003590759	11.611
LPAY2	0.0115987	0.003167724	3.662
LPAY3	-0.0596916	0.003268388	-18.263
LPEBY1	-0.416916	0.003590759	-11.611
LPEBY2	-0.0115987	0.003167724	-3.662
LPEBY3	0.05969164	0.003268388	18.263
LOTHGSA	0.0538668	0.06280784	0.858
LNONGSA	0.01833054	0.05758882	0.318
STATIOND	-0.295655	0.04029518	-7.337
UNITD	0.04522381	0.03885454	1.164
LRECRUIT	0.02046536	0.0158164	1.294
POINTS	0.20193290	0.04935853	4.091
LQMA	-0.0790456	0.06254684	-1.264
LUNEMP	-0.0456338	0.05230263	-0.872
LPCPRES	0.004249927	0.004215529	1.008
QD1	0.18767533	0.05415525	3.466
QD2	0.17164378	0.04892724	3.508
YRD	0.54600823	0.13372975	4.083

MOS 19D: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.34837064	0.01030033	33.821
LPACF	-0.318717	0.01738696	-18.331
LPEB	0.31871674	0.01738696	18.331
LY1	-0.0416916	0.003590759	-11.611
LY2	-0.0115987	0.003167724	-3.662
LY3	0.05969164	0.003268388	18.263

MOS 19K/19X: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.16776 WITH 803 DEGREES OF FEEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.847402

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	1.31938869	0.37111730	3.555
LY1	0.33170346	0.01559082	21.276
LY2	0.28786337	0.01750958	16.440
LY3	0.32597694	0.01389847	23.454
LPEB	0.46919359	0.06033582	7.776
LPACF	0.53080641	0.06033582	8.798
LY1SQ	0.12669406	0.007951083	15.934
LY2SQ	0.09490603	0.008644046	10.979
LY3SQ	0.12168088	0.007048327	17.264
LY1Y2	-0.0151694	0.002019086	-7.513
LY1Y3	-0.0227915	0.002949812	-7.726
LY2Y3	-0.0196455	0.002379158	-8.257
LPACFSQ	0.40423999	0.01650134	24.497
LPEBSQ	0.40423999	0.01650134	24.497
LPAPEB	-0.40424	0.01650134	-24.497
LPAY1	0.05605034	0.003725135	15.047
LPAY2	-0.0135984	0.002979075	-4.565
LPAY3	-0.0423557	0.004300358	-9.849
LPEBY1	-0.0560503	0.003725135	-15.047
LPEBY2	0.0135984	0.002979075	4.565
LPEBY3	0.04235569	0.004300358	9.849
LOTHGSA	-0.0274426	0.05460056	-0.503
LNONGSA	-0.0434882	0.04814584	-0.903
STATIOND	-0.0522424	0.04022381	-1.299
UNITD	0.004909885	0.03526239	0.139
LRECRUIT	0.02002519	0.01408361	1.422
POINTS	0.01446007	0.05868721	0.246
LQMA	0.08478646	0.0536766	1.580
LUNEMP	0.01375491	0.04510637	0.305
LPCPRES	-0.00437677	0.004145118	-1.056
QD1	0.04542041	0.05406688	0.840
QD2	-0.0891113	0.04110793	-2.168
QD3	0.009405308	0.04162453	0.226
YRD	0.08806878	0.08073902	1.091

MOS 19K/19X: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.39213559	0.009190337	42.668
LYPACF	-0.40424	0.01650134	-24.497
LPEB	0.40423999	0.01650134	24.497
LY1	-0.0560503	0.003725135	-15.047
LY2	0.0135984	0.002979075	4.565
LY3	0.04235569	0.004300358	9.849

MOS 888*: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.0278 WITH 829 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.763867

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.05789687	0.47834591	0.121
LY1	0.28069889	0.02375509	11.816
LY2	0.24074652	0.01903136	12.650
LY3	0.29423146	0.02003532	14.686
LOTHGSA	0.0409354	0.0746334	0.548
LPEB	0.10107405	0.08010477	1.262
LPACF	0.89892595	0.08010477	11.222
LY1SQ	0.06652907	0.008792631	7.566
LY2SQ	0.08080789	0.009539678	8.471
LY3SQ	0.11045839	0.0104656	10.554
LY1Y2	-0.000128315	0.005278305	-0.024
LY1Y3	-0.0494279	0.01089062	4.539
LY2Y3	-0.0079405	0.008085071	-0.964
LPACFSQ	0.41713630	0.0196241	21.256
LPEBSQ	0.41713630	0.0196241	21.256
LPAPEB	-0.417136	0.0196241	-21.256
LPAY1	0.02894682	0.004064643	7.122
LPAY2	0.03432031	0.005989955	5.730
LPAY3	-0.0836171	0.00746028	-11.208
LPEBY1	-0.0289468	0.00406463	-7.122
LPEBY2	-0.0343203	0.005989955	-5.730
LPEBY3	0.08361715	0.00746028	11.208
LNONGSA	0.05687463	0.06111005	0.931
STATIOND	0.0196412	0.036799	0.534
UNITD	-0.018586	0.03910579	-0.475
LRECRUIT	-0.0258101	0.0177438	-1.455
POINTS	0.03119719	0.06243327	0.500
LQMA	0.01805132	0.06675386	0.270
LUNEMP	0.005364296	0.05595044	0.096
LPCPRES	0.02477137	0.008939113	2.771
QD1	0.18281894	0.06008994	3.042
QD2	0.06963618	0.05754956	1.210
QD3	0.12787868	0.04428268	2.889
YRD	0.44152362	0.06484554	6.809

* Aggregation of 23 small Combat Arms MOSs.

MOS 888: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODEL: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.21003575	0.01527358	13.752
LPACF	-0.417136	0.0196241	-21.256
LPEB	0.41713630	0.0196241	21.256
LY1	-0.0289468	0.004064643	-7.122
LY2	-0.0343203	0.005989955	-5.730
LY3	0.08361715	0.00746028	11.208

MOS 999*: SIMULTANEOUS REGRESSION RESULTS
ON TOTAL COST

SYSTEM WEIGHTED MSE IS 1.11263 WITH 826 DEGREES OF FREEDOM
SYSTEM WEIGHTED R-SQUARE IS 0.836954

MODEL: EQ1 JGLS
DEP VARIABLE: LNCOST

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	-1.32175	0.99679686	-1.326
LY1	0.93282709	0.30529076	3.056
LY2	0.31900781	0.38734021	0.824
LY3	0.78229815	0.40764042	1.919
LPEB	0.16713681	0.06858319	2.437
LPACF	0.83286319	0.06858319	12.144
LY1SQ	0.15252591	0.0676212	2.256
LY2SQ	-0.340841	0.09913618	-3.438
LY3SQ	0.19359209	0.11463323	1.689
LY1Y2	0.29560311	0.07277639	4.062
LY1Y3	-0.514516	0.06619267	-7.773
LY2Y3	0.11484441	0.09494309	1.210
LPACFSQ	0.18731862	0.01719703	10.892
LPEBSQ	0.18731862	0.01719703	10.892
LPAPEB	-0.187319	0.01719703	-10.892
LPAY1	-0.0398935	0.008665433	-4.604
LPAY2	0.0628486	0.01131297	5.555
LPAY3	-0.0292068	0.01105615	-2.642
LPEBY1	0.03989353	0.008665433	4.604
LPEBY2	-0.0628486	0.01131297	-5.555
LPEBY3	0.02920683	0.01105615	2.642
LOTHGSA	0.04947383	0.02543016	1.945
LNONGSA	-0.223799	0.04222672	-5.300
UNITD	0.02633459	0.04298499	0.613
LRECRUIT	-0.0153724	0.01182704	-1.300
POINTS	0.30214269	0.07833911	3.857
LQMA	0.15177201	0.04755048	3.192
LUNEMP	0.14205999	0.03625554	3.918
LPCPRES	-0.0549792	0.04212819	-1.305
QD1	0.40944655	0.06262315	6.538
QD2	0.15507491	0.03786113	4.096
QD3	0.11427396	0.02905275	3.933
YRD	0.48412333	0.06040883	8.014

* Aggregation of all non-Combat Arms MOSs.

MOS 999: SIMULTANEOUS REGRESSION RESULTS
ON ENLISTMENT BONUS COST SHARE

MODE: EQ2 JGLS
DEP VARIABLE: SHREB

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	T FOR HO: PARAMETER=0
INTERCEP	0.22091519	0.05323246	4.150
LPACF	-0.187319	0.01719703	-10.892
LPEB	0.18731862	0.01719703	10.892
LY1	0.03989353	0.008665433	4.604
LY2	-0.0628486	0.01131297	-5.555
LY3	0.02920683	0.01105615	2.642

C. MOS Incentive Budget Generation and Allocation Software User Guide

Introduction

This user guide provides a brief overview of how to use the MOS Incentive Budget Generation and Allocation Software. One MOS (11X) is used to demonstrate the software, which runs exactly the same for all eight MOSs. The numbers that appear in the tables in this guide are calendar year 1987 data for MOS 11X. The coefficients that appear are estimated from eight quarters of data: calendar years 1986 and 1987.

This user guide is divided into two parts: Part I describes how to set up files and directories to run the model; Part II describes the model software.

Part I: Setting Up Files and Directories to Run the Model

Prior to setting up directories and copying files, please make a copy of the original diskettes. Once copies are made, use these to set up files and directories. Keep the original diskettes in a safe place. This user guide assumes that the default or root directory on your computer is 'C' and that LOTUS123 (version 2.0 or 2.01) is a subdirectory of the root directory. The auto123 file is set up to handle only this situation.

1. Copy auto123.wk1 into Your LOTUS123 Directory

First, copy the auto123.wk1 file into your LOTUS123 directory. This file can be found on the diskette that contains the files for MOS 11X under the sub-directory \auto\. The auto123 file will automatiacally execute when you get into LOTUS123.

2. Create a Subdirectory of Your 'C' Directory Called MOS11X

The diskette labeled MOS11X contains 17 files. All of these files should be copied into the subdirectory C:\MOS11X\.

3. Create subdirectories for each of the other MOSs using the following names:

MOS999
MOS888
MOS13B
MOS19X
MOS13F
MOS19D
MOS12B

A separate diskette for each MOS has been provided. Each diskette contains 17 files. All of these files should be copied into the appropriate subdirectory.

You should now have eight subdirectories set up, one for each MOS. Each subdirectory should contain 17 files.

4. DEFAULT and RUN Files for the Model

Five files are used as input files to the model. These five files exist in each MOS subdirectory and are particular to each MOS. The DEFAULT files are called:

DEMOG.WK1
CONTRSM.WK1
INCENT.WK1
COEF.WK1
NONMON.WK1

These files should *never* be changed!

The RUN files are denoted by '1' at the end of the file name. These files also exist in each MOS subdirectory and are particular to a MOS. *(Do not confuse these files with those called RUN1.WK1 and RUN2.WK2.)* These files

are called:

DEMOG1.WK1
CONTRSM1.WK1
INCENT1.WK1
COEF1.WK1
NONMON1.WK1

The DATA files contain four quarters of data. At this time, the DEFAULT files and the RUN files are *exactly* the same for a particular MOS. The DATA files contain four quarters of data from calendar year 1987. The COEFFICIENT file contains the default coefficient values from the estimated model.

Once you run the model, any changes or edits that you make will be saved to the RUN files in the subdirectory of the MOS that is currently running. If you want to go back to the original DEFAULT files, you must *copy* the DEFAULT files to the RUN files prior to running the model (five files must be copied) in the subdirectory of that particular MOS. If you want to use the edited RUN files, no copying is necessary. If you have created new files and saved them to new names--and you want to use these files as the RUN files--you must *copy* them to the RUN files in the subdirectory of that particular MOS. Remember, the model uses the RUN files named above, and RUN files are specific to a MOS subdirectory. The default data files should *never* be changed!

Part II: Model Software

In general, any files that you are using for this run of the model should be copied into the RUN files (see the five RUN files above). If you want to use default data and coefficient values, you should always start by copying the DEFAULT files into the RUN files in the subdirectory of the MOS that you will

be running. If you have created new files and want to use them, then start by copying these files into the RUN files of the MOS subdirectory. Note that when a file is edited in the software, it is saved as a RUN file with the *1.wk1 name. Remember, the default data files should never be changed.

The software will save your edits as RUN files. If you decide to rename them, which is suggested if you want to use them again, you must keep track of any new files you created. If you do not rename them, they will replace the current RUN files in the subdirectory of the MOS that you are running.

Assuming that you have the correct RUN files in place, you are now ready to run the model.

1. Get into the Subdirectory of LOTUS123

Type 123 to get into LOTUS. When you type 123, you will automatically be put into the cost projection software. Follow the directions on each screen and you should have no problem with the software. Each screen will now be reviewed.

Screen 1

This is simply the title of the software (see screen 1). Press Page-Down (PGDN) to continue to the next screen.

Screen 2

This screen simply tells you what the software can and cannot do (see screen 2). Press ALT-M to continue to the next screen. Throughout the software, most moving through screens is accomplished by pressing ALT and an additional letter.

SCREEN 1

U.S.A.R.E.C

MOS INCENTIVE BUDGET GENERATION & ALLOCATION
SOFTWARE

by

C. A. K. Lovell
R. C. Morey
L. L. Wood

(Press PGDN to continue)

SCREEN 2

This software will allow you to:

1. Edit exogenous variables in the model
2. Edit the parameters of the model
3. Run cost allocation projections
4. View output from the cost allocation projections

This software will not allow you to reestimate the model parameters.

In order to use the software effectively, please follow directions at the top/bottom of each screen.

(Press ALT-M to continue)

Screen 3

You are given a choice of MOSs (see screen 3). Move the cursor to the number of the MOS of your choice and press ALT-S (for select). For demonstration, choose MOS 11X.

Screen 4

Now that you've chosen a MOS, a choice screen will appear that will allow you to edit any of the five RUN files, to run the model, or to exit from the software (see screen 4). Let's choose option 1, "Edit demographic/ environment data file." Move the cursor to 1 and press ALT-S.

Screen 5

The demographic/environmental variable data file (see screen 5) contains four quarters of data for the following variables: national number of production recruiters, national number of qualified military available (QMA), national mean unemployment rate, national mean percent present on the first three screens for this MOS, and whether or not guidance counselors received points for this MOS in a given quarter. The four quarters of data correspond to the four quarters in calendar year 1987.

Directions appear at the top of the screen. Each of the numbers in this file can be edited by using the arrow keys to move the cursor to the number that you want to change, typing in the new number, and pressing ENTER. The new number will now be in the place of the old number.

All of the data files can be edited in this same manner. To save the changes you've made to the file and exit, press ALT-S. The RUN file, DEMOG1.wk1, will be updated to reflect these changes and you will return to the

SCREEN 3

Choose one of the following MOSs:

```
1  MOS 11X
2  MOS 12B
3  MOS 13B
4  MOS 13F
5  MOS 19D
6  MOS 19X (note:  19X is 19K and 19X combined)
7  MOS 888 (note:  888 is other Combat Arms)
8  MOS 999 (note:  999 is all non-Combat Arms)
```

(Use arrow keys to move cursor to the number of your selection and press ALT-S)

SCREEN 4

MOS: 11X

Choose one of the following:

1 Edit demographic/environment data file
2 Edit contract data file
3 Edit monetary incentives data file
4 Edit model coefficients file
5 Edit nonmonentary incentives data file
6 Run model and view output and results
7 Exit cost projection program

(Move the cursor to the number of your selection and press ALT-S)

SCREEN 5

****
USE ARROWS KEYS TO EDIT FILE.
PRESS ALT-S TO SAVE CHANGES AND EXIT
PRESS ALT-Q TO QUIT WITHOUT SAVING
****

MOS 11X: DEMOGRAPHIC-ENVIRONMENTAL VARIABLE FILE

	NUMBER PROD. RECRUIT.	QMA (100,000)	UNEMP RATE (MEAN)	% FIRST 3 SCREENS (MEAN %)	GUID.COUNS POINTS? (1=YES,0=NO)
QTR.	ENTER NAT'L TOTALS		ENTER NAT'L AVERAGES		POINTS?
1	4935	96.3302	0.0735	34.82	1
2	4980	96.3302	0.0645	39.79	1
3	4906	96.3302	0.0636	39.31	1
4	5024	96.3302	0.0618	89.2	1

choice screen (screen 4). If you've made a mistake and do not want to save the changes, press ALT-Q. This will quit screen 5 without saving your changes and will return you to the choice screen (screen 4).

After returning to screen 4, move the cursor to option 2, "Edit contract data file." Press ALT-S to make your choice.

Screen 6

The contract data file (see screen 6) contains total contracts by quarter for 2-year, 3-year, and 4-year or more contracts. The four quarters of data correspond to the four quarters in calendar year 1987 for MOS 11X.

Directions appear at the top of the screen. Like the demographic data file, each of the numbers in this file can be edited by using the arrow keys to move the cursor to the number that you want to change, typing in the new number, and pressing ENTER. The new number will now be in the place of the old number.

To save the change you've made to the file and exit, press ALT-S. The RUN file, CONTRSM1.wk1, will be updated to reflect these changes and you will return to the choice screen (screen 4). If you've made a mistake and do not want to save the changes, press ALT-Q. This will quit screen 6 without saving your changes and will return you to the choice screen (screen 4).

After returning to screen 4, move the cursor to option 3, "Edit monetary incentives data file." Press ALT-S to make your choice.

Screen 7

The monetary incentives data file (see screen 7) contains average dollar amounts for the enlistment bonus (EB) and the Army College Fund (ACF) for four quarters. The four quarters of data correspond to the four quarters in calendar

SCREEN 6

```
************ *************************
  USE ARROWS KEYS TO EDIT FILE
PRESS ALT-S TO EXIT AND SAVE FILE
PRESS ALT-Q TO QUIT WITHOUT SAVING
*************************************
```

MOS 11X: ENTER TOTAL CONTRACTS BY TYPE AND QTR.

QUARTER	TWO YR CONTRACTS	THREE YR CONTRACTS	FOUR+ YR CONTRACTS
1	1036	423	1293
2	778	838	1244
3	786	324	1352
4	569	513	1181
TOTAL:	3169	2098	5070

SCREEN 7

```
**********************************
  USE ARROWS KEYS TO EDIT FILE
PRESS ALT-S TO EXIT AND SAVE FILE
PRESS ALT-Q TO QUIT WITHOUT SAVING
**********************************
```

MOS 11X: ENTER AVERAGE INCENTIVE AMTS ($) BY QTR

QTR.	EB	ACF
1	2710	3256
2	3500	3227
3	3500	3138
4	3500	3249

EB: Enlistment Bonus
ACF: Army College Fund

year 1987 for MOS 11X.

Directions appear at the top of the screen. Like the demographic data file, each of the numbers in this file can be edited by using the arrow keys to move the cursor to the number that you want to change, typing in the new number, and pressing ENTER. The new number will now be in the place of the old number.

To save the changes you've made to the file and exit, press ALT-S. The RUN file, INCENT1.wk1, will be updated to reflect these changes and you will return to the choice screen (screen 4). If you've made a mistake and do not want to save the changes, press ALT-Q. This will quit screen 7 without saving your changes and will return you to the choice screen (screen 4).

After returning to screen 4, move the cursor to option 4, "Edit model coefficients file." Press ALT-S to make your choice.

Screen 8

The model coefficients file (see screen 8) contains the estimated model coefficients for MOS 11X using eight quarters of data (calendar years 1986 and 1987).

Directions appear at the top of the screen. Like the demographic data file, each of the numbers in this file can be edited by using the arrow keys to move the cursor to the number that you want to change, typing in the new number, and pressing ENTER. The new number will now be in the place of the old number. A word of *caution*, however. This file should not be edited unless you re-estimate the model. When you reestimate the model, the new coefficients can simply be entered in this file.

To save the changes you've made to the file and exit, press ALT-S. The RUN file, COEF1.wk1, will be updated to reflect these changes and you will return to

SCREEN 8

''''''''''''''''''''''''''''''''''''
USE ARROWS KEYS TO EDIT FILE
PRESS ALT-S TO EXIT AND SAVE FILE
PRESS ALT-Q TO QUIT WITHOUT SAVING
''''''''''''''''''''''''''''''''''''

MOS 11X: MODEL COEFFICIENTS

VARIABLES	EQ1 LN(COST)	EQ2 SHARE EB
INT	0.87821	0.27275
LY1	0.46897	-0.1104
LY2	0.32552	0.07003
LY3	0.15372	0.07006
LPEB	0.04215	0.43610
LPACF	0.95784	-0.4361
LY1SQ	0.13287	
LY2SQ	0.10363	
LY3SQ	0.11937	
LY1Y2	-0.1213	
LY1Y3	-0.0412	
LY2Y3	-0.0062	
LPACFSQ	0.43510	
LPEBSQ	0.43610	
LPAPEB	-0.4361	
LPAY1	0.11048	
LPAY2	-0.0700	
LPAY3	-0.0700	
LPEBY1	-0.1104	
LPEBY2	0.07003	
LPEBY3	0.07006	
LOTHCSA	-0.0006	
LNONCSA	-0.0375	
UNIT	0.05010	
STATION	-0.0161	
LRECRUIT	-0.0068	
LQMA	0.04573	
POINTS	0.20783	
LUNEMP	0.06467	
LPCPRES	-0.0012	
QD1	0.27593	
QD2	0.12758	
QD3	0.01537	
TRD	0.49323	

the choice screen (screen 4). If you've made a mistake and do not want to save the changes, press ALT-Q. This will quit screen 8 without saving your changes and will return you to the choice screen (screen 4).

After returning to screen 4, move the cursor to option 5, "Edit nonmonetary incentives data file." Press ALT-S to make your choice.

Screen 9

The nonmonetary incentives data file (see screen 9) contains two nonmonetary incentives: "station of choice" and "unit of choice." If the nonmonetary incentive was available to this MOS, a 1 should be entered. If the nonmonetary incentive was unavailable, 0 should be entered. In addition, two competitive effects variables--other GSA contracts (i.e., GSA contracts in a MOS other than this one) and non-GSA contracts in all MOSs--appear in this file. The four quarters of data correspond to the four quarters in calendar year 1987 for MOS 11X.

Directions appear at the top of the screen. Like the demographic data file, each of the numbers in this file can be edited by using the arrow keys to move the cursor to the number that you want to change, typing in the new number, and pressing ENTER. The new number will now be in the place of the old number.

To save the changes you've made to the file and exit, press ALT-S. The RUN file, NONMON1.wk1, will be updated to reflect these changes and you will return to the choice screen (screen 4). If you've made a mistake and do not want to save the changes, press ALT-Q. This will quit screen 9 without saving your changes and will return you to the choice screen (screen 4).

After returning to screen 4, move the cursor to option 6, "Run model and view output and results." Press ALT-S to make your choice.

SCREEN 9

''
USE ARROWS KEYS TO EDIT FILE.
PRESS ALT-S TO SAVE CHANGES AND EXIT
PRESS ALT-Q TO QUIT WITHOUT SAVING
''

MOS 11X

	NONMONETARY INCENTIVE AVAILABLE? (1=YES,0=NO)		ENTER TOTALS FOR THE FOLLOWING CONTRACTS	
QTR.	UNIT	STATION	OTHER GSA	NON-GSA
1	0	1	16737	13161
2	0	1	13997	11692
3	0	1	16555	13174
4	0	1	13834	11041

Screens 10 and 11

The model is now running (see screens 10 and 11) and you must wait for further instructions. Due to the size of the model, the results are computed in two parts, as indicated on screens 10 and 11. It takes less than one minute to run, so just wait for instructions.

Screen 12

The budget generation results choice screen will appear when the model has run (see screen 12). Three options are available: option 1 will allow you to view efficient total costs by quarter; option 2 will allow you to view efficient cost shares and takers by quarter; option 3 will allow you to exit the cost projection software. Choose option 1 by moving the cursor to 1 and pressing ALT-S.

Screen 13

This screen shows the total cost projection computed by the model. Press ALT-P to print the results. Press ALT-S to return to the results choice screen (screen 12).

After returning to screen 12, move the cursor to option 2, "Efficient Cost Shares and Takers by Quarter." Press ALT-S to make your choice.

Screen 14

This screen shows the efficient enlistment bonus and Army College Fund cost shares and takers by quarter, as computed by the model. Press ALT-P to print the results. Press ALT-S to return to the results choice screen (screen 12).

After returning to screen 12, move the cursor to option 3, "EXIT Cost Projection Software." Press ALT-S to make your choice.

SCREEN 10

COST PROJECTION MODEL RUNNING
PLEASE WAIT FOR INSTRUCTIONS

PART 1

SCREEN 11

COST PROJECTION MODEL RUNNING
PLEASE WAIT FOR INSTRUCTIONS

PART 2

SCREEN 12

MOS INCENTIVE BUDGET GENERATION RESULTS

MOS: 11X

1 Efficient Total Costs by Quarter
2 Efficient Cost Shares and Takers by Quarter
3 EXIT Cost Projection Software

(Use arrow keys to move cursor to the number of your selection and press ALT-S)

SCREEN 13

TOTAL COST PROJECTION
MOS: 11X

TOTAL COST

QTR.	Cost ($)
1	7668355
2	6321457
3	4592664
4	4290973
TOTAL	22872651

(Press ALT-S to continue,
Press ALT-P to print screen)

SCREEN 14

COST SHARES AND INCENTIVE TAKERS
MOS: 11X

	EFFICIENT COST SHARE			EFFICIENT NUMBER OF TAKERS	
QTR.	EB	ACF		EB	ACF
1	0.002	0.998		7	2350
2	0.195	0.805		352	1578
3	0.145	0.855		190	1251
4	0.188	0.812		231	1072
			TOTAL:	795	6234

(Press ALT-S to continue,
Press ALT-P to print screen)

Screen 15

This screen provides a warning about saving your edited files under new files names. Option 2 will exit from the software back to LOTUS123. For demonstration, move the cursor to option 1 and press ALT-S.

Screen 16

This screen simply tells you again the names of the RUN files and gives you the option of printing out the names. Press ALT-P to print file names. Again, you must keep track of files that you edit. Press ALT-E to exit software and return to LOTUS123.

You should now be out of the budget generation software and in your LOTUS123 subdirectory. If you want to go through the model for a different MOS, you must get into the software again by typing 123, then pressing ENTER. The software runs for one MOS at a time.

Note About Other Files

There are 17 files in each MOS subdirectory, of which we've named only the five DEFAULT and five RUN files. The other seven files used in the software should not be altered by the user. These files are as follows:

1. Choices.wk1: The editing and viewing choices are provided in this file.
2. Utility.wk1: A file to remind you to save files you edited to new file names.

3\. and 4. Run1.wk1 and Run2.wk1: The model is computed in run1.wk1 and run2.wk1; results are saved in run2.wk1.

5. Results.wk1: This provides the user with the output menu and is called from run2.wk1 after the model actually runs.

SCREEN 15

You are about to exit the cost projection program. Your edited data files WILL BE WRITTEN OVER when you use the software AGAIN. If you want to save these files they should be copied NOW to new file names which you must provide following the directions below. Do you want to copy your files now?

1 Yes, I want to copy files now
2 EXIT cost projection software

(Move cursor to the number of your selection and press ALT-S)

SCREEN 16

Each set of run files resides in a particular MOS directory denoted by C:\MOS***\ where *** is the name of the MOS. Any files that you edited have been saved as run files. Copy run files that you want to save to new filenames when you exit to DOS. The input and output run files are:

		Run Files:
1.	Demographic/environ. data file:	Demog1.wk1
2.	Contract data file:	Contrsml.wk1
3.	Monetary incentives data file:	Incent1.wk1
4.	Coefficients file:	Coef1.wk1
5.	Non-monetary incentives file:	Nonmon1.wk1
6.	Total cost projections:	Result1.wk1
7.	Cost shr. & taker projection:	Result2.wk1

(Press ALT-P to print file names.
Press ALT-E to exit to DOS)

6. and 7. Result1.wk1 and Result2.wk1: Output files that the user can view and print out.

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